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RESEARCH ARTICLE

A study on the challenges faced by teachers in the effective implementation of blended teaching methods (flipped, game-based and peer-to-peer teaching) in various colleges of Tumkur city

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Abstract: The rapid shift towards digital education has forced colleges in Tumkur to adopt blended teaching methods; yet, teachers struggle to bridge the gap between traditional lecturing and interactive pedagogies like Flipped, Game-Based and Peer-to-Peer teaching. While these methods aim to improve student engagement, their success is often hampered by a "digital divide" where rural student demographics lack the consistent access to internet required for out-of-class learning components. Consequently, educators face a triad of challenges: insufficient technical training, a rigid academic syllabus that leaves little room for innovation and a lack of institutional infrastructure to support modern classroom dynamics. This study empirically examined the barriers to adopting blended teaching methods among college educators in Tumkur city. A quantitative survey design was employed, involving faculty members from 11 colleges representing Arts, Science and Management disciplines. Data were collected using a structured questionnaire based on a 5-point Likert scale and responses were analysed using descriptive statistical techniques, including percentage-based interpretation. The sample comprised early-career (25–35 years) and senior (>45 years) educators, with teaching experience ranging from 6–10 years to over 15 years. Findings indicated that while all respondents were aware of blended teaching strategies and acknowledged their pedagogical benefits, actual classroom adoption remains limited. Specific challenges associated with each blended teaching method were identified. In the case of the *Flipped Classroom*, effective implementation was found to rely heavily on students' prior engagement with pre-class learning materials. Inadequate preparation by students often reduced the effectiveness of in-class activities, thereby limiting opportunities for higher-order cognitive engagement. Additionally, the development of high-quality instructional content required substantial time investment and advanced digital competencies. *Game-Based Learning:* Teachers highlighted difficulties in identifying or designing instructional games that are pedagogically aligned with curriculum objectives. Such activities were not seriously considered and learners faced financial constraints and limited access. *Peer-to-Peer Teaching:* Challenges included potential misinformation among students, social issues and distractions and difficulty in ensuring equal participation. These results provide actionable insights for policymakers, institutional administrators and faculty training entities to develop targeted interventions that support teachers in effectively implementing blended methodologies, thereby promoting more inclusive and experiential learning environments.

Keywords: Flipped learning, Game-based, Peer-to-Peer, Challenges, Effectiveness, India

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Introduction

The landscape of higher education is undergoing a paradigm shift from traditional teacher-led instruction to student-centric models, accelerated by the global integration of Information and Communication Technology (ICT). In the context of Tier-2 cities like Tumkur, Blended Learning—defined as a formal education program that combines traditional classroom methods with online digital media—has emerged as a vital bridge to modernise pedagogy (Garrison & Kanuka, 2004). This method seeks to optimise the "synchronous" interaction of the classroom with the "asynchronous" flexibility of digital platforms, theoretically enhancing student engagement and learning outcomes.

Categories of blended teaching methods

Effective implementation in various colleges often utilises specific sub-models, each carrying unique pedagogical goals:

Flipped classroom

This model reverses the traditional instructional cycle. Students gain first exposure to new material outside of class (via videos or readings) and use class time for active learning, such as problem-solving or debates (Lage et al., 2000). Research suggests this promotes higher-order thinking, yet its success depends heavily on student self-discipline and pre-class preparation.

Game-based learning

Game-Based Learning (GBL) integrates game characteristics and principles into learning activities to increase motivation and provide immediate feedback (Plass et al., 2015). In the competitive academic environment of Tumkur, GBL can reduce "learning anxiety", though it requires teachers to possess high technological pedagogical knowledge.

Peer-to-peer teaching

Based on Vygotsky's (1978) Social Constructivism, Peer-to-Peer (P2P) teaching involves students instructing one another under faculty supervision. This method leverages the "Zone of Proximal Development", where students often grasp complex concepts more easily when explained by a peer who shares a similar cognitive framework.

In recent years, Tumkur has emerged as a major educational hub in Karnataka, driven by its proximity to Bangalore and rising demand for higher education. This growth highlights the need for sustainable development within institutions, especially in promoting quality education. Innovative blended teaching methods—such as flipped, game-based and peer-to-peer learning—are crucial for achieving this.

This study examines the organisational conditions and difficulties teachers encounter in implementing blended methods, evaluates current practices and proposes practical improvements. The conceptual framework draws on the TPACK model and UTAUT theory to analyse factors influencing effective technology integration in Tumkur's educational context.

Building a research gap requires demonstrating that while the benefits of blended learning are well-documented, the organisational conditions often fail to support the teacher in the field. Below is the background of organisational difficulties as reported in existing literature, which sets the stage for your specific study in Tumkur.

Organisational conditions and difficulties encountered by teachers

Previous research indicates that the transition to blended learning is not merely a pedagogical shift but a complex organisational challenge. Studies have identified three primary categories of difficulties that create an "implementation gap":

Institutional readiness and infrastructure constraints

Literature consistently reports that a lack of "Institutional Maturity" is a primary barrier (Haber & Mills, 2008). In the Indian context, the 'Digital Divide' remains the most significant organisational hurdle. Research highlights that while colleges may have centralised Wi-Fi, the lack of "equitable access" for students—especially those from rural backgrounds—prevents teachers from making online components mandatory (Bhadri & Patil, 2022). This creates a condition where teachers are forced into "double-teaching"—delivering content online and then repeating it in class for those who could nott access it.

Systemic rigidity and time-workload pressures

A major organisational difficulty reported is the Syllabus-Time Paradox. In many Indian higher education institutions, the academic calendar is rigid, focusing on "covering" the syllabus for university examinations rather than "uncovering" concepts through active learning (Agarwal & Purohit, 2019). Studies show that teachers perceive methods like Game-Based Learning and P2P as "time-consuming" luxuries that the organisational structure does not reward. Furthermore, the lack of specialised administrative support for content creation often results in a massive increase in teacher workload, leading to "techno stress" and resistance to change (Ye et al., 2022).

Professional development and technical support gaps

Research underscores that "sporadic training" is insufficient for effective implementation. The TPACK Gap—a disconnect between subject expertise and technological-pedagogical skill—is often ignored by organisations that provide "one-size-fits-all" ICT workshops (Mishra & Koehler, 2006). Previous studies in Karnataka specifically highlight that while 95% of institutions claim to adopt modern methods (NEP 2020), less than 50% of students meet competency levels because the organisational support for sustained teacher mentoring is missing (PARAKH Report, 2024).

Introduction to the TPACK framework

The TPACK (Technological Pedagogical Content Knowledge) framework is a seminal theoretical model designed to explain the complex set of knowledge required by teachers to integrate technology effectively into their classrooms. Developed by Punya Mishra and Matthew J. Koehler in 2006, the framework builds upon Lee Shulman's idea of Pedagogical Content Knowledge (PCK). It posits that effective technology integration is not about using digital tools in isolation, but rather about the dynamic intersection of three primary forms of knowledge: Content, Pedagogy and Technology.

At its core, TPACK suggests that teachers must understand how these three domains interact to create a meaningful learning experience. It moves away from the "techno centric" view—where the tool is the focus—and emphasises that the choice of technology should be driven by the specific subject matter and the teaching strategies best suited for that topic. The framework is often visualised as a Venn diagram, where the overlapping areas represent more nuanced, synthesised forms of expertise.

In a blended or digital learning environment, the TPACK framework serves as a roadmap for professional development. It highlights that knowing how to use a computer (Technology Knowledge) is useless if the teacher doesn't understand how to teach (Pedagogical Knowledge) or doesn't have a deep grasp of the subject (Content Knowledge). The "sweet spot" is the centre of the framework, where a teacher can intuitively select a digital tool that specifically enhances a pedagogical strategy to make a difficult concept easier for students to grasp.

The TPACK framework

The TPACK framework, developed by Mishra and Koehler (2006), argues that for effective blended teaching, an educator must master the complex interplay between three primary forms of knowledge.

- Content Knowledge (CK): The actual subject matter (e.g., Physics, Commerce).

- Pedagogical Knowledge (PK): The "how-to" of teaching—instructional methods and classroom management.

- Technological Knowledge (TK): Proficiency with digital tools (e.g., LMS platforms, gaming software).

Relevance to the study

In the colleges of Tumkur, many teachers possess high CK and PK due to years of experience. However, the study investigates the "TPK" (Technological Pedagogical Knowledge) gap—the ability to understand how a tool like "Flipped Classrooms" changes the very nature of teaching. The challenge often isn't a lack of subject knowledge, but an inability to integrate technology into a specific pedagogical strategy without losing control of the curriculum.

The UTAUT model

The Unified Theory of Acceptance and Use of Technology (UTAUT), formulated by Venkatesh et al. (2003), is the gold standard for explaining why individuals adopt or reject new technology. It posits that four key factors determine a teacher's "Behavioural Intention" to use blended methods.

The four core factors of UTAUT

Performance Expectancy: The degree to which a teacher believes that using a "Flipped" or "Game-Based" method will help them attain gains in job performance (e.g., better student results).

Effort Expectancy: The degree of ease associated with the use of the system. In Tumkur, if a teacher finds setting up a digital game too cumbersome, they will reject it regardless of its benefits.

Social Influence: The degree to which a teacher perceives that "important others" (Principals, University Boards, or Peer HODs) believe they should use the new technology.

Facilitating Conditions: The degree to which a teacher believes that an organisational and technical infrastructure exists to support the use of the system (e.g., IT support, high-speed Wi-Fi and flexible lab hours).

Relevance to the study

This model is critical for identifying the Research Gap in Tumkur. While "Performance Expectancy" might be high (teachers know blended learning is good), the "Facilitating Conditions" in Tier-2 colleges are often weak. This study uses UTAUT to measure whether the lack of adoption is a personal choice (Effort Expectancy) or an organisational failure (Facilitating Conditions).

Synthesis: Why these models matter together

While TPACK measures the teacher's internal competency, UTAUT measures the external and psychological environment. By using both, your study can pinpoint if the "Challenges" are due to a lack of teacher skill (TPACK) or a lack of institutional support and social pressure (UTAUT).

Core variables of the study

Independent variables

Blended teaching methods

In the context of modern pedagogy, Blended Teaching Methods (BTM) (also known as Hybrid Learning) are defined as a formal education strategy that integrates traditional face-to-face classroom instruction with online/digital learning opportunities, providing students with some element of control over time, place, path, or pace (Horn & Staker, 2014).

Dependent variables

Implementation challenges

The implementation challenges are categorised into four "pressure points" to facilitate an accurate definition.

Technological Infrastructure: The lack of "readiness" regarding hardware, software and high-speed connectivity. This includes the Digital Divide, where unequal access to technology creates an uneven playing field for students.

Pedagogical shift: The difficulty teachers face in moving from a lecture-based "transmitter" of knowledge to a "facilitator" of digital experiences. It involves the complex task of determining which content belongs in a physical classroom and which is better suited for an asynchronous online environment.

Individual readiness: The struggle for students to exercise self-regulation. In a blended model, the learner must take more ownership of their schedule; implementation fails when students lack the time-management skills to handle the "online" portion of the course.

Institutional support: The systemic hurdles, such as a lack of professional development for staff, rigid traditional grading systems that don't account for digital work and insufficient time allocated for teachers to redesign their curriculum.

The "bottom line" definition

Implementation Challenges are the systemic and individual frictions that occur when an institution attempts to synthesise physical and virtual learning spaces. They are not just "glitches", but rather fundamental misalignments between old teaching habits and new technological requirements.

Statement of the problem

Tumkur city is very popular for education hub through various well-known and reputed educational institutions innovative teaching methods like blended teaching methods (flipped, game-based and peer-to-peer teaching etc.,) plays a major role in giving quality education of its stakeholders. The level and various requirements of students differ from time to time. This paper focuses on to understand the present conditions, requirements and their effectiveness of various parameters to blended teaching methods to give quality education at various educational institutions in Tumkur city.

Objectives

The growing emphasis on innovative pedagogical approaches has led to the increasing adoption of blended teaching methods such as flipped classrooms, game-based learning and peer-to-peer teaching. Despite their potential to enhance student engagement and learning outcomes, the extent of awareness, understanding and implementation of these methods among college teachers remains uncertain. This study seeks to address this gap by examining the awareness and understanding of college teachers regarding blended teaching methods, as well as the extent to which these approaches are adopted in college classrooms in Tumkur city.

In addition, the research explores the challenges faced by teachers in effectively implementing blended teaching strategies and analyses the role of infrastructural, technological and administrative support in facilitating their adoption. By identifying these factors, the study aims to provide meaningful recommendations that can help overcome existing barriers and promote the effective integration of blended teaching methods in higher education.

Research gap

While global and national studies focus on metropolitan "Tier-1" cities or general university settings, there is a significant vacuum in research focusing on Tier-2 educational hubs like Tumkur. Most existing literature does not account for the specific socio-economic profile of Tumkur, where a high percentage of students

are first-generation learners from rural outskirts. This study fills that gap by investigating how these broad organisational challenges manifest in the local context of Tumkur's diverse colleges

Hypotheses

H1: College teachers in Tumkur city possess awareness and understanding of blended teaching methods (flipped, game-based and peer-to-peer teaching).

Earlier research highlights that blended learning approaches such as flipped classrooms, gamification and peer teaching have gained global recognition for improving student engagement and learning outcomes. Studies show that flipped classrooms enhance self-directed learning and academic achievement, while peer teaching fosters deeper content processing and collaborative learning environments. However, awareness among teachers varies depending on institutional exposure and training. In many contexts, teachers demonstrate partial understanding but lack comprehensive knowledge of blended strategies. This hypothesis is grounded in the assumption that awareness exists but may differ in depth and breadth across faculty members, making it essential to empirically assess the level of understanding among college teachers in Tumkur city.

H2: Blended teaching methods are adopted in college classrooms in Tumkur city.

Blended learning adoption has been widely documented in higher education, with institutions integrating digital tools alongside traditional teaching to enhance flexibility and student-centred learning. Systematic reviews confirm that blended learning is increasingly implemented across universities worldwide, though adoption levels vary depending on technological infrastructure, faculty readiness and institutional support. In India, the University Grants Commission (UGC) has emphasised blended modes of teaching through initiatives like MOOCs and SWAYAM, encouraging faculty to adopt hybrid pedagogies. This hypothesis builds on the premise that Tumkur city colleges, being part of the broader Indian higher education ecosystem, are likely to have initiated blended teaching practices, though the extent of adoption remains to be empirically validated.

H3: Teachers face challenges in implementing blended teaching strategies effectively.

While blended learning offers pedagogical advantages, multiple studies highlight challenges faced by educators in its implementation. Research identifies barriers such as limited digital literacy, inadequate training, resistance to change and difficulties in balancing online and offline components. The COVID-19 pandemic accelerated the adoption of blended teaching, but many teachers struggled with sustaining quality due to lack of preparedness and institutional support. These findings suggest that challenges are not unique to one region but are common across diverse educational contexts. This hypothesis is justified by the expectation that teachers in Tumkur city, like their counterparts elsewhere, encounter similar obstacles in effectively implementing blended strategies.

H4: Infrastructural, technological and administrative support significantly influences the effective implementation of blended teaching methods.

Successful integration of blended learning depends heavily on institutional support, availability of ICT infrastructure and administrative commitment. Studies emphasise that teachers' ability to adopt blended methods is shaped by access to reliable internet, digital platforms and supportive policies. Administrative leadership also plays a critical role in capacity building, resource allocation and fostering a culture of innovation. Without adequate infrastructural and technological support, blended learning risks becoming ineffective or unsustainable. This hypothesis is grounded in the conceptual understanding that institutional ecosystems directly influence teaching practices and therefore, the effectiveness of blended teaching in Tumkur city is expected to be contingent upon these support mechanisms

H5: Recommendations can be developed to overcome challenges in the adoption of blended teaching methods.

Literature consistently suggests that teacher training, pedagogical innovation and policy support are key to overcoming barriers in blended learning adoption. Studies highlight the importance of continuous

professional development, integration of ICT tools and collaborative teaching models to enhance effectiveness. In the Indian context, national education policies encourage blended learning as a means to bridge gaps in accessibility and quality. This hypothesis is justified by the expectation that evidence-based recommendations, tailored to local contexts such as Tumkur city, can provide actionable strategies for institutions and educators to strengthen adoption and sustainability of blended teaching methods.

Literature Review

Few research based articles are reviewed as below (2020–2025).

Literature on challenges of blended teaching methods

Blended learning has been widely adopted in Indian higher education, especially after the NEP 2020. Shariq and Bharathy (2025) synthesised evidence from 46 studies across India, noting uneven adoption due to infrastructural gaps and teacher preparedness. Pandey (2025), in a study at Ratan Sen Degree College, Uttar Pradesh, reported that 120 undergraduate students and 15 faculty members struggled with integrating online tools despite policy support. Laxmi (2020) examined teacher education programs in Andhra Pradesh with 80 participants, highlighting digital literacy gaps among faculty. A validation study of the Blended Learning Effectiveness and Challenges Scale (BLECS) with 300 students in Karnataka (Anonymous, 2025) confirmed that teacher readiness was a stronger predictor of success than infrastructure. Collectively, these studies show that while blended learning is policy-driven, semi-urban contexts like Tumkur remain underexplored.

Literature on flipped classroom approaches

Flipped classrooms have been studied extensively for their impact on engagement. Satapathy and Sarangi (2025) conducted an empirical study in Siliguri, West Bengal, with 200 B.Ed. students, finding improved engagement but significant resistance among teachers due to preparation demands. Eltahir and Alsalhi (2025) examined 150 undergraduates in Ajman University, UAE, reporting increased motivation but noting that faculty workload was a barrier. Baig and Yadegaridehkordi (2023), in a systematic review of 52 studies, highlighted persistent challenges in teacher adaptation. These findings converge on the idea that flipped classrooms are effective but require strong institutional support and teacher training.

Literature on game-based learning

Game-based learning has gained traction as a motivational tool. Mushtaq et al. (2025) conducted a bibliometric analysis of 310 publications, showing global growth but limited empirical adoption in Indian contexts. Khoo et al. (2024) studied 250 undergraduates in Malaysia, finding cognitive benefits but cautioning against superficial gamification. Hulus (2025), in a UK-based study with 80 postgraduate students, emphasised theoretical gaps in integrating video games into curricula. In India, Kode (2025) surveyed 150 engineering students in Hyderabad, reporting motivational benefits but challenges in aligning games with curriculum objectives. These studies highlight that teachers often lack training in game design, undermining effective implementation.

Literature on peer-to-peer teaching

Peer learning and assessment models are increasingly recognised but remain underutilised. Noroozi and De Wever (2023) presented empirical findings from 200 students in the Netherlands, showing improved collaboration but requiring strong facilitation. Fleckney et al. (2024), in a study at the University of Melbourne with 120 architecture students, found peer assessment effective but complex to design. In India, Hemlata and Yadav (2025) surveyed 100 faculty members in Rajasthan, noting cultural resistance to collaborative learning. Banwari (2025) studied 80 students in Gujarat, highlighting both opportunities and challenges in implementing peer-based pedagogical innovations under NEP 2020. These findings suggest that peer-to-peer teaching requires not only structural support but also cultural shifts in teacher and student attitudes.

Critical synthesis

- Convergence: Most studies agree that blended, flipped, game-based and peer-to-peer methods enhance engagement and learning outcomes.

- Contradictions: Benefits are often offset by teacher workload, lack of training and cultural resistance.

- Empirical Gaps: Few studies focus on semi-urban Indian colleges; most research is either metropolitan or international.

- Implication: Our Tumkur-based study addresses a clear research gap by examining localised challenges in blended teaching implementation.

Research Methodology

A structured questionnaire was designed to collect data on college teachers' awareness, adoption and challenges related to blended teaching methods in Tumkur city. The questionnaire was distributed to a total of 75 teaching faculty members across selected colleges. Out of these, 68 respondents returned the completed questionnaire and after screening for completeness, 60 valid responses were considered for analysis.

A stratified random sampling technique was adopted to ensure representation from different streams, including Commerce, Science, Arts and Management. A total of 60 teachers from various colleges participated in the study, as detailed in Table 1. The table provides the distribution of respondents across institutions and disciplines, highlighting proportional representation from each stream. This sample size was considered adequate to provide meaningful insights into the awareness, adoption, challenges and support systems related to blended teaching methods in the region.

Table 1: Distribution of respondents across colleges and streams in Tumkur city

Particulars	Frequency	Percentage
Sri Siddhartha Institute of Management Studies, Tumkur	06	10%
Sri Siddhartha Institute of Business Management, Tumkur	06	10%
Ananya Institute of Commerce and Management, Tumkur	05	8.33%
Sri Siddhartha Institute of Technology, Tumkur	05	8.33%
Varadaraja Degree College, Tumkur	06	10%
Sri Sapthagiri PU College, Tumkur	05	8.33%
Tumkur University PG Centre, Tumkur	06	10%
Hemadri Post Graduate Centre, Tumkur	05	8.33%
Sri Siddaganga College of Arts, Science and Commerce for Women, Tumkur	05	8.33%
SVS First Grade College, Tumkur	05	8.33%
Seshadripuram College, Tumkur	06	10%

Reliability and validity of the instrument

To ensure the robustness of the research instrument, reliability was assessed using Cronbach's alpha. The overall reliability coefficient was found to be 0.80, which indicates a high level of internal consistency and suggests that the items in the questionnaire measured the intended constructs consistently. Cronbach's alpha value above 0.70 is generally considered acceptable in social science research and the obtained value demonstrates that the instrument is reliable for the present study.

Validity was established through both content validity and construct validity. Content validity was ensured by consulting subject experts in education and pedagogy, who reviewed the questionnaire items to confirm their relevance and appropriateness to the research objectives. Construct validity was examined through a pilot study with a small group of faculty members, where feedback was collected to refine ambiguous or overlapping items. The alignment of the questionnaire items with established dimensions of blended teaching practices (awareness, adoption, challenges and institutional support) further supports the validity of the instrument. Together, these measures confirm that the tool is both reliable and valid for capturing the perspectives of college teachers in Tumkur city.

Data collection tools

Primary data

The study is based on Primary and Secondary Data. The study mainly depends on Primary data collected through a well-framed and structured questionnaire through Google form with a Five-point Likert scale to elicit the well-considered opinions of the various teachers working with various educational Institutions in Tumkur city for a period of 38 days from 1st September to 8th October 2025

Secondary data

Review of journals, reports and previous research on blended learning, Institutional documents, policy papers and UGC guidelines.

Research Instruments: A questionnaire with closed-ended questions and Likert-scale is used. The questionnaire will include items measuring: Familiarity with blended teaching techniques, Institutional support and resources, Perceived student engagement and Technological barriers and time management issues

Data analysis techniques

The data collected through Google form were summarised on the basis of the response by the customers through Five-point Likert scale. The information gathered through the questionnaires will be analysed with the help of a Statistical Technique like Chi-square using MS Excel.

Ethical consideration

All participants will be informed about the purpose of the study. Participation will be voluntary and confidentiality will be maintained. Data will be used solely for academic purposes.

Results and Discussion

Table 2 depicts that 47% of the respondents belong to 25-35 year age, 30% of the respondents belong to 36-45 year age, 13% of the respondents belong to 46-55 year age, 10% of the respondents belong to below 25 year age and no respondent found in the category of above 55 years age. This distribution suggests the research sample skews towards younger and middle-aged groups, with minimal input from senior staff or those over 55.

Thirty percent of the respondents are having 6-10 years' experience, 27% are having above 15 years of service, 23% are below 5 years and 20% belongs to 11-15 years of service. The distribution reflects a balanced sample with both early-career and experienced teachers. This diversity is valuable for studying challenges and opportunities associated with blended teaching methods and innovations in higher education.

Table 2: Age of the respondents used in this research survey

Variable	Details	Frequency	Percentage
	<25 years	6	10%
	25-35 years	28	47%
Age	36-45 years	18	30%
	46-55 years	8	13%
	>55 years	0	0%
	<5years	14	23%
Teaching experience	6-10 years	18	30%
	11-15 years	12	20%
	>15 years	16	27%

Table 3 depicts that all respondents were familiar with the concept of blended teaching methods. This shows that blended teaching methods are broadly recognised among faculty members in Tumkur colleges. This high level of familiarity suggests a conducive institutional environment for the effective implementation of blended learning initiatives and for conducting further research. Regarding the usage of blended teaching, 42% of the respondents reported using peer-to-peer teaching, 29% were using flipped

teaching, 27% were using game-based teaching and 2% were not using any of the above methods. These results indicate a strong adoption of blended teaching techniques within Tumkur colleges, particularly peer-based collaborative approaches. Regarding the frequency of implementation, 47% of respondents reported occasional use, 27% used frequently, 17% used consistently, 6% used rarely and 3% never used.

Table 3: Concept of blended teaching methods

	Statement	Frequency	Percentage
Familiarity	Yes	60	100%
	No	00	00%
Usage in classes	Flipped Teaching	28	29%
	Game-Based Teaching	26	27%
	Peer-to-Peer Teaching	40	42%
	None	02	2%
Frequency of implementation	Always	10	17%
	Often	16	27%
	Sometimes	28	47%
	Rarely	4	6%
	Never	2	3%

Table 4 presents faculty perceptions regarding challenges associated with the implementation of blended teaching methods. Regarding the preparation of flipped classroom materials (e.g., videos and instructional slides), 40% of respondents disagreed that they encountered difficulties, while 27% remained neutral, 23% agreed, 6% strongly agreed and 4% strongly disagreed. This pattern indicates that more than two-fifths of the respondents did not experience substantial challenges in developing flipped teaching resources, suggesting the presence of adequate technical skills, pedagogical competence or institutional support mechanisms.

Concerning student engagement, 50% of respondents agreed that lack of student participation constituted a major challenge in flipped classrooms, followed by 20% neutral responses, 20% disagreement and 10% strong agreement. This distribution highlights student engagement as a critical constraint, underscoring the necessity for targeted pedagogical interventions, motivational strategies and active learning designs to enhance learner involvement and maximise the effectiveness of flipped instructional models in Tumkur colleges.

Regarding game-based teaching, 40% of respondents agreed that designing engaging educational games is challenging, whereas 30% disagreed, 17% strongly agreed and 13% reported neutral views. While a substantial proportion of educators perceive this as a pedagogical challenge, nearly one-third expressed confidence, possibly reflecting variations in disciplinary demands, teaching experience or exposure to instructional design practices.

With respect to classroom management during game-based activities, 37% of respondents agreed that managing classrooms becomes difficult, 33% disagreed, 27% remained neutral and 3% strongly agreed. This finding suggests considerable heterogeneity in faculty experiences, likely influenced by teaching styles, classroom dynamics, subject specialisation and familiarity with interactive pedagogical methods.

Regarding peer-to-peer teaching, 47% of respondents agreed that students are often unwilling or insufficiently prepared to participate, followed by 23% neutral, 17% disagreement and 13% strong agreement. These findings indicate that student readiness and motivation represent substantial barriers to effective collaborative learning, emphasising the need for structured orientation programmes, preparatory tasks and scaffolding strategies.

The perceptions of institutional support revealed that 33% of respondents disagreed that their colleges provide adequate training for implementing blended teaching methods, whereas 30% agreed, 17% were neutral and 17% strongly agreed. This suggests inconsistencies in professional development provisions across institutions, with a considerable proportion of faculty expressing dissatisfaction with existing training opportunities. Consequently, systematic capacity-building initiatives, continuous professional development

programmes and institutional policy support are required to ensure effective adoption of blended pedagogical approaches.

Table 4: Difficulties faced by college teachers in preparing flipped teaching materials

Variable	Particulars	Frequency	Percentage
Difficulties faced by college teachers in preparing flipped teaching materials	Strongly Agree	4	06%
	Agree	14	23%
	Neutral	16	27%
	Disagree	24	40%
	Strongly Disagree	2	4%
Lack of student participation is a challenge in flipped classrooms	Strongly Agree	6	10%
	Agree	30	50%
	Neutral	12	20%
	Disagree	12	20%
	Strongly Disagree	0	00%
Designing engaging games for classroom teaching is challenging	Strongly Agree	10	17%
	Agree	24	40%
	Neutral	8	13%
	Disagree	18	30%
	Strongly Disagree	0	00%
Classroom management is difficult during game-based activities	Strongly Agree	02	3%
	Agree	22	37%
	Neutral	16	27%
	Disagree	20	33%
	Strongly Disagree	0	00%
Students are often unwilling or unprepared to participate in peer-to-peer teaching	Strongly Agree	8	13%
	Agree	28	47%
	Neutral	14	23%
	Disagree	10	17%
	Strongly Disagree	0	00%
Training for implementing blended teaching methods	Strongly Agree	10	17%
	Agree	18	30%
	Neutral	10	17%
	Disagree	20	33%
	Strongly Disagree	02	03%

Table 5 presents faculty perceptions regarding the effectiveness of teaching methods on students' learning outcomes. With respect to the flipped classroom approach, 47% of respondents rated it as highly effective, 43% as moderately effective and 10% expressed neutral views. The absence of negative ratings reinforces teachers' perceptions of pedagogical value and instructional relevance of this approach in improving students' conceptual understanding.

Similarly, 37% of respondents rated peer-to-peer teaching as highly effective, 57% as moderately effective and 6% remained neutral. These findings demonstrate endorsement of collaborative learning strategies, suggesting that peer interaction and cooperative engagement are vital in promoting deeper learning and knowledge retention.

Regarding the combined use of multiple blended teaching strategies, 70% of respondents reported high effectiveness, 23% moderate effectiveness and 7% neutrality. This finding highlights the synergistic benefits of integrating diverse pedagogical approaches, which appear to enhance instructional flexibility, accommodate varied learning styles and facilitate superior academic outcomes and conceptual clarity.

Table 5: Effect of teaching methods on students' academic performance

Variable	Effect	Frequency	Percentage
Effect of flipped classroom teaching methods on students' understanding and learning outcomes	Highly Effective	28	47%
	Moderately Effective	26	43%
	Neutral	6	10%
	Less Effective	0	00%
	Not Effective	0	00%
Effect of peer-to-peer teaching methods on	Highly Effective	22	37%
	Moderately Effective	34	57%

Variable	Effect	Frequency	Percentage
students' engagement and comprehension	Neutral	4	06%
	Less Effective	0	00%
	Not Effective	0	00%
Effects of blended teaching methods on students' understanding and learning outcomes	Highly Effective	42	70%
	Moderately Effective	14	23%
	Neutral	4	07%
	Less Effective	0	00%
	Not Effective	0	00%

The association between flipped classroom teaching methods on students' understanding and learning outcomes were found to be insignificant. Hence, no association was established.

Table 6: Details of chi-square test

Table No.	Question	Result
1	Peer-to-peer teaching methods improve student engagement and comprehension.	40.67
5	Do they face difficulties in preparing flipped teaching materials (videos, slides, etc.)?	36.67
7	Designing engaging games for classroom teaching is challenging.	42
13	Using a combination of two or three blended teaching methods (flipped, game-based, peer-to-peer) improves learning results and makes concepts easier to understand.	78

Discussion

The analysis of the survey data reveals a significant implementation paradox in Tumkur city colleges: faculty members possess high awareness (100%) and an overwhelmingly positive perception of blended teaching methods (over 90% rate them as effective), yet the actual frequency of implementation remains low (47% use them only "sometimes"). This section discusses the findings by grouping the identified challenges into three thematic categories, interpreted through the lens of the established Conceptual Framework (TPACK and UTAUT).

Thematic barrier: Infrastructural and institutional deficiencies

(Theoretical Link: UTAUT's Facilitating Conditions and TPACK's Technological Knowledge)
The most salient finding is the challenge rooted in institutional support and infrastructure. The data shows that 77% of respondents cite limited technological infrastructure as a barrier to flipped learning and 63% report inadequate technology as a major overall challenge.

Comparison to Literature: This finding aligns strongly with previous systematic reviews (e.g., Ama, 2025; Mamun & Dippro, 2025) which consistently identify unequal technology access and insufficient infrastructure as key global barriers to blended learning adoption.

Conceptual Insight (UTAUT): In terms of the UTAUT Model, these findings point directly to critically low Facilitating Conditions. While teachers have high Performance Expectancy (they believe BTMs work), the lack of reliable digital resources, smart classrooms and internet access severely limits their ability to translate that positive intent into consistent Use Behaviour.

Conceptual Insight (TPACK): The reported lack of adequate training (36% dissatisfaction) further undermines the foundation of Technological Knowledge (TK). Without institutional investment in modern technology and continuous, targeted professional development, the TPACK competency of teachers—particularly the ability to integrate Technology with Pedagogy—cannot be sustainably enhanced.

Thematic barrier: Pedagogical design and assessment complexity

(Theoretical Link: TPACK's Pedagogical Knowledge and TPK)
Beyond infrastructure, teachers report difficulty in the actual execution and evaluation of BTMs, indicating a gap in specialised pedagogical skills.

Challenges in Design: The finding that 57% of faculty finds it challenging to design engaging games underscores the difficulty in developing content that effectively merges disciplinary knowledge with the

motivational elements of game mechanics. This is a clear deficit in Technological Pedagogical Knowledge (TPK), which requires knowing how technology (the game) can best deliver subject matter content.

Challenges in Assessment: Half (50%) of the respondents struggle to assess student performance in peer-to-peer activities. Traditional assessment metrics are often ill-suited for evaluating collaborative skills and process-oriented learning. This problem highlights a deficit in core Pedagogical Knowledge (PK) specific to cooperative learning, which needs to be addressed through training on alternative, rubric-based assessment strategies. The complexity of these methods contributes to higher Effort Expectancy (UTAUT), making teachers less likely to use them frequently.

Thematic barrier: Student readiness and participation

(Theoretical Link: UTAUT's Social Influence and Contextual Factors)

The success of BTMs depends heavily on students adopting an active, self-directed role. The study reveals a significant contextual friction point here.

Student resistance

60% of faculty cited lack of student participation in flipped learning and a similar 60% found students unwilling/unprepared for peer-to-peer teaching.

Contextual insight

This suggests that the Social Influence of the educational environment is not yet aligned with active learning models. Students may lack the necessary time management skills for pre-class work (flipped learning) or the collaborative skills required to teach peers. This is a critical challenge, as the fundamental benefits of BTMs (as supported by Boehm-Fischer & Beyer (2024), on combined blended approaches) cannot be realised if the students resist their active roles.

Conclusion on findings and hypothesis

The statistical analysis led to the rejection of the Null Hypothesis confirming the perception that teachers do take effective measures and BTMs are valued for strengthening quality education. This result reinforces the high Performance Expectancy among faculty.

The synthesis of the discussion leads to the conclusion that institutional and systemic factors, primarily the low Facilitating Conditions (lack of infrastructure and training), are the dominant variables restraining the shift from a willing, aware and positive faculty to one that implements blended teaching consistently and effectively. The findings shift the burden of challenge from teacher commitment to institutional preparedness and policy.

Conclusion

The study comes out with positive response from the various respondents.

Teachers are familiar with blended teaching methods and facilities provided in the Institute are met the present requirements of the students' fraternity.

In this study, it is concluded that the Educational Institutions in Tumkur city are facing good competition from each other to provide Quality education. Flipped, Game-Based and Peer-to-Peer Teaching methods were effective if applied with periodic training of faculties with their high level commitment to work. These Institutions are attracting students with various commitments need to be improved over a period of time and to be fulfilled to satisfy them more effectively. The objectives stated in the study are fulfilled and the Null Hypothesis is found rejected.

Limitations

The present study is subject to certain limitations that must be acknowledged. The sample size was restricted to 60 teachers due to time constraints and the difficulty of collecting responses, which required repeated

reminders to participants. Furthermore, a noticeable unwillingness to participate was observed among some faculty members, possibly stemming from fear, lack of interest, or reluctance to engage with the questionnaire. This may have influenced the richness of the data collected. Another limitation arises from the dynamic nature of respondents' attitudes, which can change over time; therefore, the findings may not remain applicable in the long run. Finally, the study was confined to 11 colleges within Tumkur city, which limits the generalisability of the results to other regions or institutions.

Recommendations

Based on the findings of the study, several recommendations can be made to strengthen the adoption and effectiveness of blended teaching methods. Periodic training programs for faculty members should be prioritised to enhance awareness and skills in designing and implementing blended approaches, particularly flipped classrooms and game-based learning. Institutions should place greater emphasis on research activities alongside routine teaching responsibilities, as this fosters innovation and deeper engagement with pedagogical practices. Recruitment policies may benefit from selecting teachers who demonstrate genuine passion for teaching, ensuring higher motivation in adopting new methods.

To meet international standards and compliance requirements, colleges should maintain high academic and pedagogical benchmarks. Faculty and staff should be recognised and treated as valuable assets, with adequate support and incentives provided to encourage their participation in blended learning initiatives. Student involvement in blended classrooms should be continuously monitored and adapted to ensure active engagement. Finally, strong and consistent management support is essential, as administrative backing plays a crucial role in overcoming infrastructural and technological challenges and in achieving the expected outcomes of blended teaching practices.

Future scope for research

The present study concentrated on Tumkur city. Further research can be done at the district level covering all 10 Taluks of Tumkur District.

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RESEARCH ARTICLE

Project presentation: From target audience analysis to the use of artificial intelligence

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Abstract: The article analyses modern methods of preparing presentations for various types of projects, ensuring that the presenter delivers a clear, concise, vivid and convincing presentation speech. It emphasises the task of increasing interest in the project, primarily among the target audience, i.e. decision-makers and those who can influence decisions on the organisation of project activities. The most important methodological issues of the presentation that optimise the content of the project are identified. When defining the project's objectives, the presenters are recommended that the SMART methodology be used. The article emphasises that the simplicity of the presentation both facilitates understanding the content and the results of the project by the audience and helps the speaker stay focused on the main issues and logic of the presentation. Microsoft's general-purpose programs are recommended as universal tools for creating and combining the text, illustrations, graphs and other presentation tools. Artificial intelligence enables automated data analysis, enhancing content visibility for search engines and improving its relevance to the target audience. The authors conclude that the basis of presenters' professionalism is diligent training and psychological literacy that ensure their constructive interaction with the audience.

Keywords: Project presentation, Presenter, Audience, Decision makers, Neural network program, Artificial intelligence

Introduction

A project presentation is a combination of text, computer animation, various types of graphics, video and audio (but not necessarily all together) that are used to demonstrate the content of the project in a comprehensible scenario. Such demonstrations are conducted at all stages of project development — initial, intermediate and final ones. As a rule, they either start or end the project activities. Scientific and practical forums, conferences and round-table discussions are organised to present large-scale and socially significant projects.

The most important feature of any project presentation is interactivity, i.e. a fairly close informational and communicational interplay between the speaker and the audience — the group of people who attend the project presentation and are interested in it. Among these, there may be decision-makers (DMs) and influencers (Is). Together, they represent the target audience of the presentation. If DMs are people whose will and resources determine the very possibility of implementing the project, the Is are people representing the interests of the environment (industrial, sociocultural, or geographical) that the project activity is aimed

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at improving. The destiny of the project largely depends on the motivation, values and expectations of the DMs and Is. This explains why it is crucial to know in advance who those people are, how competent they are in the subject area, what may interest them most and how they feel about the subject of the presentation in general. The most common form of presentation is considered to be reports at the initial stage of project activities aimed at convincing the audience of the feasibility and practical significance of the planned work (Garr, 2014; Weissman, 2021; Rabadanov & Eldarov, 2024).

Goal setting and presentation planning

The main questions of the presentation concerning the content of the project are as follows: 1) What are the objectives of the project? 2) Why is it important for the project team that all the tasks set are completed?

In recent years, project developers, when defining their objectives, have preferred to rely on the well-established SMART methodology that emphasises five key features of a project: 1) Specific, 2) Measurable, 3) Achievable, 4) Relevant and 5) Time-bound. It should be noted that the SMART method of project goal setting is, in itself, an alternative. The contradictory nature of approaches to goal setting is reflected primarily in the third, central element of the SMART acronym, the letter A, that can be interpreted as Achievable, i.e. a smart and prudent goal, or Adventurous, i.e., a smart and audacious goal (Figure 1).
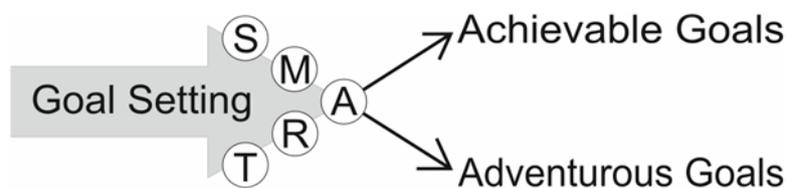

Figure 1: Unity and contradiction of SMART criteria for project goal defining

Source: Rabadanov and Eldarov (2025)

It is much easier to convince an audience of the benefits of prudent and achievable goals than bold and risky ones. This explains why adventurous and ambitious projects are usually initiated and implemented by the wealthiest businesspeople and companies. The following two megaprojects currently underway are striking examples thereof: 1) the construction of The Line – a unique, glass-clad linear city in Saudi Arabia and 2) the launch of Mars colonisation in the 21st century. The first project is led by Saudi Prince Mohammed bin Salman, while the second one is supervised by Elon Musk, an American billionaire and public figure.

The Line, a new city in Saudi Arabia with a population of 9 million, will stretch in a straight line for 170 km from the Red Sea into the Arabian Peninsula and comprise residential, commercial and entertainment areas, schools, parks, business centres, etc. As for Elon Musk's megaproject, his company SpaceX is currently conducting flight tests of super-heavy Earth-Mars space shuttles that will refuel in the orbits of these two planets, making soft landings thereon. According to forecasts by the European Space Agency, the first human landing on Mars might take place as early as the 2030s (Berger, 2021; Zuleta, 2022; Rabadanov & Eldarov, 2024).

To secure finance for their undertakings, Mohammed bin Salman and Elon Musk made impressive presentations of their ambitious projects. The Line, a $320 billion project, is 50 % financed from the country's budget. Elon Musk's business empire launching space rockets, producing solar panels, electric vehicles and developing energy storage technology also relies on multibillion dollar government subsidies.

For a project of any scale, it is vital to have financial support from the government and a profound interest in achieving its goals on the part of both the project team and the society. The practice of enforcing the project's objectives on the project team is unacceptable. They must be approved by the team and serve as an inspiring factor (Ekeruke, 2022). To this end, the project objectives must be discussed with both your team and the stakeholders. If the project is developed by a large company, understanding its goals should

not be limited to one department. It is worth finding out the opinion of employees from other departments (sales, operations, finance, logistics, etc.)

After presenting the project objectives, the audience is introduced to a detailed plan (or a roadmap) for achieving them. Planning allows the project to be presented in perspective. Depending on the type of project, its plan may include such key details as: 1) the scope, structure and methodology of the project development; 2) resources and budget estimates; implementation schedule and deadlines; criteria for commissioning and acceptance of work, etc.

There are no set rules for writing a presentation script. However, it is expected to consists of three main parts: 1) the introduction, 2) the main body, 3) the conclusion (key conclusions).

Firstly, it is important to keep in mind that not everyone has the time or desire to delve into the details of the project. For some, a "snapshot" of the project is sufficient. This is the purpose of the Introduction, which provides a brief overview of what the presentation is about and what is relevant to the audience. Here, you can limit yourself to the project title and summary. The summary (one to two pages long) should include only essential information: 1) the project's objectives and relevance, 2) the main points of the plan, 3) the results, conclusions and recommendations for the project (Ekeruke, 2022; Rabadanov & Eldarov, 2025).

Secondly, many people expect the presentation to outline the details of the project that will ensure its success. This is the purpose of the Main Body which includes information on the basic resources, planned results, possible risks and deadlines. Essentially, it should focus on the problem that the presented product or service is designed to solve. Here, you can present the most important results of preliminary research and concise statistics, as well as other key information on the topic under discussion.

Thirdly, the presentation cannot do without a conclusion, which summarises the implementation of the plan with key findings and recommendations. It is advisable to end the presentation on a high note that can be expressed in a powerful call to action, a memorable story, or intriguing figures, such as the expected growth rates of profitability and company value over the next five to ten years, projected revenues, etc. A pull quote, such as "Truth is ever to be found in the simplicity and not in the multiplicity and confusion of things." (Isaac Newton), would be appropriate for the final part. Finally, at the very end of the presentation, a simple expression of gratitude, such as "Thank you for your time" or "Thank you for your attention and the wonderful experience of communicating with you" is a must (Bourne, 2007; Rabadanov & Eldarov, 2024).

Simplicity is the key to a successful presentation

Simplicity of presentation not only makes it easier for the audience to understand the content and results of the project, but also helps the speaker stay focused on the main issues and logic of the presentation scenario. Below are seven tips on how to make a presentation easy to understand:

- use language that is simple and understandable to everyone, without technical jargon and complex grammatical constructions that could confuse the audience;
- do not overdo it with slides, as this will only hinder the overall perception of the presentation;
- the report will be more understandable and visually appealing if you use high-quality images with interesting content;
- lists must be marked, with complex information broken down into small, understandable fragments;
- the entire presentation should be designed in a uniform style, including the colour of the illustrations, font styles and font sizes;
- slides should not be crammed with text, as this distracts the audience from the main theme of the presentation;

- the presenter's attention and, therefore, that of the audience, should be focused on the fundamental aspects of the project under discussion.

Table 1: Number of slides used according to presentation time

| Presentation time in minutes	Number of slides
5	5-7
10	10-12
15	13-15
20	16-20
30	21-25
45	26-30
60	31-40

Source: Rajpurohit (2023)

Table 1 shows how many slides can be considered acceptable taking into account the duration of the presentation. To convey the most important information about the project and help the audience better understand the speaker, one is expected to use vivid images, videos, diagrams and charts. If you prioritise quality over quantity and adhere to the principle of one idea per slide, the audience will believe that you value their time (Rabadanov & Eldarov, 2025).

A key practical recommendation is to avoid overcrowding slides with text and refrain from reading directly from them during the presentation. Slides are intended to support the presenter rather than replace the presentation itself. This distinction is essential for maintaining audience engagement.

Presentation design requirements

Microsoft Excel, the world's most popular spreadsheet program, offers a variety of accessible colourful graphs and charts. Typical templates for various graphical models — pie charts, line charts, scatter plots, histograms, line graphs, etc., are shown in Figure 2.
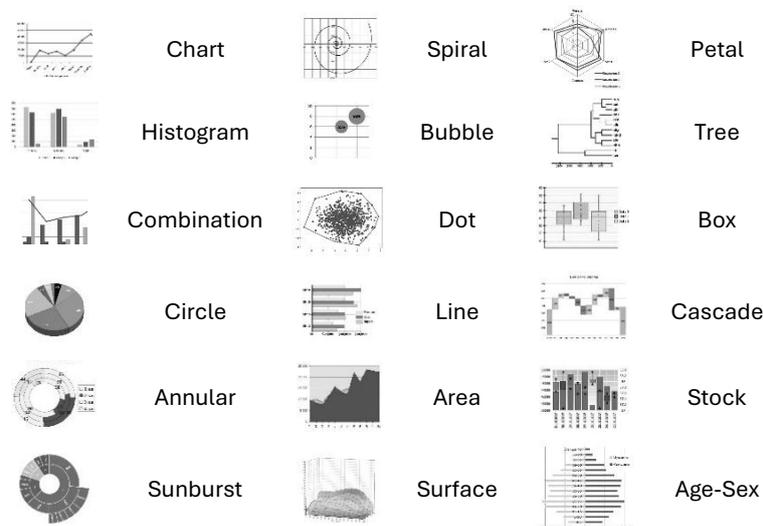
Figure 2: MS Excel spreadsheet graph and chart templates

Pie charts are ideal for demonstrating percentage ratios. Vertical histograms are good for illustrating temporal variations, while horizontal bar charts help compare quantitative indicators. Infographics (information in the form of images) serve to visualise data and explain complex information, such as market trends. By adjusting the graphic models built into Microsoft Excel, you can create both two-dimensional and three-dimensional images.

It is preferable to use no more than two topic-related images in one slide. Only high-quality illustrations are suitable for slide design: low-resolution (dpi) images and videos can impair their perception by the audience, while high-resolution visual objects will remain vivid even on large screens.

When designing slides, consider the colour range of the images. The general rule is to use colours that evoke positive emotions, such as yellow, orange and red. Cold colours, such as blue, green and purple, can fill the audience with a sense of calm. To make the image more vivid and the project itself visually appealing, the background elements of the slide or image should be sufficiently contrasting.

A consistent text style must be maintained throughout the presentation. Fonts should not be ornate or small, as this strains the viewer's eyes. Arial, Calibri, Verdana and other fonts that are familiar to the eye and suitable for both small and large screens may be used. Font sizes smaller than 30 points for the main text and 36 points for headings are not recommended (Ekeruke, 2022; Rabadanov & Eldarov, 2024).

Using artificial intelligence when preparing presentations

Recent years have been marked by the widespread use of new information technologies in project development and presentation—neural network programs that mimic the workings of the human brain and are collectively referred to as artificial intelligence (AI). Such programs enable the presenters use original graphic models and obtain new interesting ideas and solutions (Gefen, A et al., 2021; Rabadanov & Eldarov, 2025).

In the previous section, we discussed the use of familiar built-in style templates from the Microsoft Office suite, including the Excel spreadsheet program and the Word text editor. The tables or diagrams from these two programs are traditionally used to demonstrate the timing schedules for the implementation of project's specific objectives. Below is an example of a timing schedule for a one-year period (Table 2), typical for institutions in the scientific research, educational and socio-political spheres (Nikitenko & Bortnik, 2007, pp. 103-104).

Table 2: Timing schedule for project's specific objectives completion

Event	Months of the current year								Next year			
	5	6	7	8	9	10	11	12	1	2	3	4
Purchase of handouts and office supplies	x	x	x	—	—	—	—	—	—	—	—	—
Selection of participants	—	x	x	x	—	—	—	—	—	—	—	—
Staff training	—	—	x	—	—	—	—	—	—	—	—	—
Publication of research results	—	—	—	x	—	x	—	x	—	x	—	x
Selective tendering	—	—	—	—	x	—	x	—	—	—	—	—
Consultations	—	—	—	—	—	x	x	x	x	x	—	—
Assessment of intermediate results	—	—	—	—	—	x	—	x	—	—	—	—
Assessment of the final result	—	—	—	—	—	—	—	—	—	—	—	x
Interim reports	—	—	—		—	—	x	—	x	—	—	—
Final report	—	—	—	—	—	—	—	—	—	—	—	x

Table 2, created in Microsoft Word, contains a summary of the data for a specific project. We used this table to create a more visual diagram generated using ChatGPT, which is currently one of the most popular neural networks. The artificial intelligence was asked: "Draw a diagram for the presentation based on the data in Table 2, which would make it easy to track information about planned project activities by month of the year. It is important to have two interpretations of the vertical sequence of events: forward and reverse. Therefore, two diagrams should be created: Figure 3a and Figure 3b. Abbreviated names for all 12 months should also be added to each chart".

The artificial intelligence successfully interpreted the project's planned event sequence in both forward (table) and reverse (diagram) order (Figures 3a and 3b). In both diagrams, the black bars indicate the months during which the event took place.
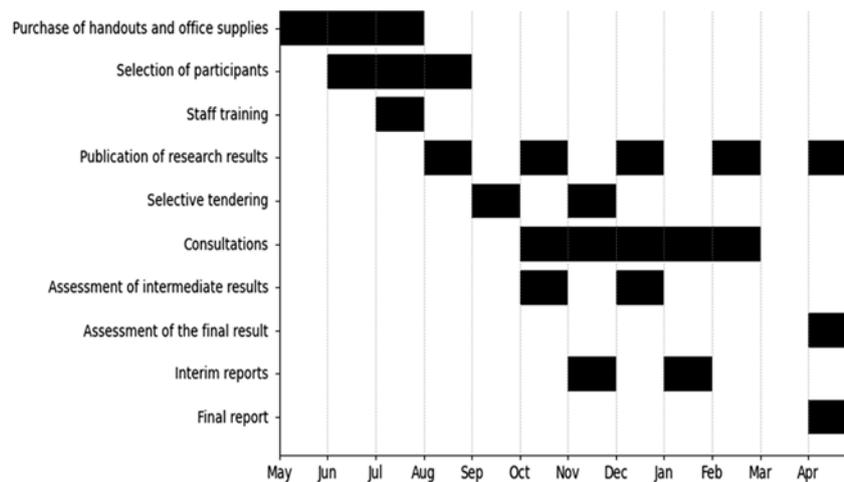
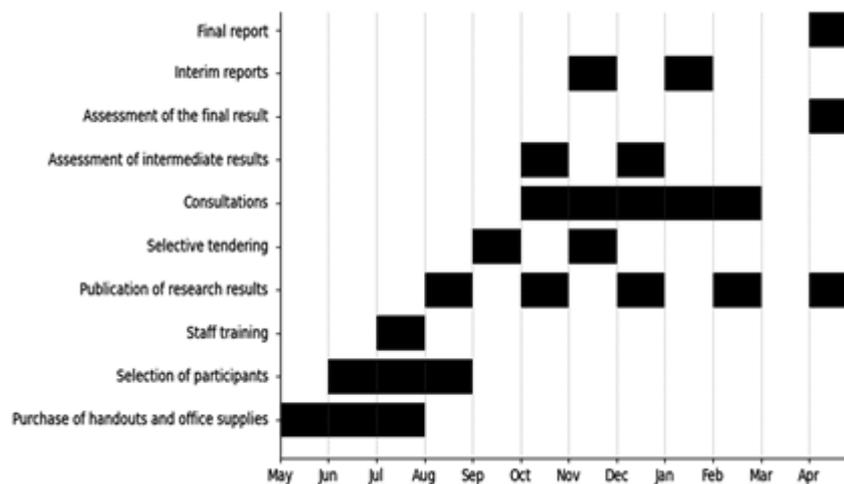**Figure 3a: Diagram generated by ChatGPT neural network based on the data in Table 2 (forward order)**

Figure 3b: Diagram generated by ChatGPT neural network based on the data in Table 2 (reverse order)

We found a diagram that displayed events in reverse order, from the bottom column of the diagram, «Purchase of handouts and office supplies», to the top column, «Final Report» (Figure 3b), which was found to be more intuitive. Thus, the ChatGPT neural network helped us visualise the presented tabular data and optimise the layout of the text describing the key characteristics of the resulting diagram. However, the choice of AI modelling techniques should be guided by their interpretability for the audience.

As demonstrated earlier, Microsoft Excel offers a wide range of chart types for visualising project processes, including those presented in Table 2. Our experience with ChatGPT suggests that AI significantly simplifies the management of various modelling parameters and algorithms.

It can be concluded that the cognitive capabilities of modern neural network-based programs significantly simplify presentation creation. Using AI in preparing presentations offers the following advantages:

1. Automatic selection of clear, concise and expressive titles that make it easier for the audience to perceive the information discussed.

2. Fast and accurate removal of backgrounds from any images to create professional slides without visual noise.

3. Quick removal of unnecessary elements from photos.

4. Processing of low-quality images: AI can improve the resolution and clarity of visual material.

5. Drawing missing elements in photos or adapting the format to the required specifications.

6. Improving the clarity and conciseness of text while preserving the key meaning.

7. Generating unique icons, illustrations and infographics on any given topic.

8. Analysing text and highlighting key points, which helps to quickly create clear and compelling slides.

9. Replacing objects in images based on text descriptions while preserving the realism and style of the image (Chan, 2023).

Modern neural network programs are capable of supporting any data format, explaining it, identifying trends and performing calculations. They also do a good job of creating visual graphs based on small tables. However, there are a number of limitations to using such programs. These include strict limits on the use of free versions of the programs, the non-editability of AI-generated graphs, as well as extremely low efficiency when working with large databases: the services either return errors or significantly simplify the source information (Rezaev & Tregubova, 2023; Baiburin et al., 2024; Rabadanov & Eldarov, 2025).

Professional approach to presentations

A presentation may fail if the speaker's performance is not convincing. Do your best to plan and prepare the presentation and to convey your thoughts to the audience in a vivid and convincing manner. In this sense, the experience of organising and conducting the above-mentioned presentations of mega-projects for the construction of a road city and the colonisation of Mars with unique AI animations generated by advanced neural network platforms is an illustration thereof.

We consider the presentation experience of another successful entrepreneur, Steve Jobs (1955-2011), a founder of the famous Apple company, to be no less effective (Gallo, 2010). Let us elaborate on some details of this experience.

Steve Jobs usually spent at least two days preparing for his presentations. In his opinion, training is the key to successful performance. You can practice by reading your speech aloud in a quiet place. While doing it, make audio and video recordings of your speech so that you could review them later. It would be even better to rehearse your presentation in front of friends and colleagues to find out what was missing and how well it fits into the allotted time. At the same time, it would be helpful to decide beforehand on the location of the speaker during the project presentation. If you plan to use video or audio information, familiarise yourself with technical settings and operations of the equipment and make sure that everything is working properly.

Start your presentation with a strong and engaging introduction. This could be, for example, a good joke or an interesting question for the audience. Another option for starting a presentation is to tell a short exciting story. A third option is to share some interesting facts or statistics. For example, you can show an entertaining video or visual images that naturally arouse people's curiosity.

It cannot be ruled out that the presentation may not go as planned. Therefore, it is good practice to have backup materials and be flexible enough to make emergency adjustments during the presentation. For example, if it is the end of the working day and the audience are tired, it is better to significantly shorten the presentation time. Inviting questions and facilitating post-presentation discussion promotes audience engagement and reinforces confidence in the professionalism of the project team.

Psychologically, you are expected to adapt to the moods, beliefs and cultural values of your audience. So, learn about their likes and dislikes, social and ethno-cultural status, as well as their ethical and political preferences. Another important principle is to always be sincere when communicating with your listeners. By gaining people's trust in this way, you increase their interest in the project. However, do not go too far, since the main thing in a presentation is still to convey the essence of the matter to the listeners. Some of your arguments and facts may cause mixed reactions with the audience. In this regard, carefully consider all possible counterarguments and prepare concise and clear answers to controversial questions about the content of your speech (Rabadanov & Eldarov, 2025). A well-written script helps to better understand the details of the project, to hold the audience's attention and convince those present of the viability and effectiveness of the planned project (Garr, 2014). End your presentation with simple words of thanks.

Conclusion

Thus, the success of a presentation is largely determined by setting clear goals, having a firm plan and presenting the content of the project in a comprehensible way. This requires a very careful approach to the design and presentation of the material. In this regard, visualising information using neural network programs can be particularly effective.

AI tools can greatly enhance presentation preparation; however, excessive reliance on them may undermine authenticity and negatively influence audience perception. Therefore, AI should be regarded as a complementary resource rather than a substitute for human expertise.

The concluding part of the presentation should state the main results of the project activities, the major findings of the research, as well as practical recommendations related to the implementation of the project. These conclusions and recommendations serve as a vivid and powerful call to real action.

Ultimately, an ideal presentation is the one that conveys information about the project in a way that reflects the shared interests of the presenter and the audience. Only a truly engaging, exciting and convincing presentation can ensure that the audience fully understand what the project entails, how it will be carried out and why it is vital to implement.

No conflict

The authors declare that there is no conflict of interest

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RESEARCH ARTICLE

The role of agricultural cooperatives in agricultural input and output marketing: in the case of Bale zone, Oromia region, Ethiopia

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Abstract: Agricultural cooperatives play a significant role in improving farmers' access to agricultural inputs and markets. In Ethiopia, they are considered important institutions for enhancing rural livelihoods, increasing income and addressing market challenges faced by smallholder farmers. The general objective of this study was to investigate the role of agricultural cooperatives in agricultural input–output marketing in Bale zone. Specifically, the study examined members' participation in cooperative marketing activities, assessed members' perceptions of cooperative performance and identified factors affecting the effectiveness of cooperatives in delivering input–output marketing services. The study employed descriptive and explanatory research designs. Both primary and secondary data were used. A purposive sampling technique was applied and 340 valid questionnaires were analysed. Structural equation modelling (SEM) using AMOS 23 and SPSS version 26 was employed for data analysis. The results revealed that members' perception of cooperative performance, satisfaction with cooperative services, infrastructure and organisational factors had a positive and significant effect on input–output marketing. However, members' participation in cooperative affairs, perceptions of transparency and accountability and external factors showed a negative effect on input–output marketing performance. The study recommends that agricultural cooperatives should provide timely and adequate agricultural inputs, improve service quality and ensure fair and timely distribution of benefits. The government and cooperatives should also strengthen members' awareness and participation and invest in infrastructure such as roads, communication systems, electricity and market facilities to improve the effectiveness of agricultural input–output marketing.

Keywords: *Agricultural cooperatives, Agricultural input marketing, Agricultural output, Marketing, Member participation, Market performance*

Introduction

Background of the study

Agriculture is the main economic pillars of the Ethiopian economy and the economic growth of the country is highly dependent on the success of the agriculture sector. The country's economy is largely based on agricultural sector. (CSA, 2016).

Agricultural cooperatives are often seen as key institutional intervention in enhancing farmers' access to markets, as one form of institution that fulfil exchange and coordination functions in an economy (Barrett, 2008, Hellin et al., 2009). In Ethiopia, agricultural cooperatives are playing a crucial role in the country's past and current development strategy (Mersha and Ayenew, 2018). Agricultural cooperatives are given the

highest priority for improving access to markets and technologies for enhancing the productivity of smallholder agriculture in the country. As part of its effort to transform the agricultural sector, the Ethiopian government places a very strong emphasis on promoting cooperatives as one of the main organisational mechanisms to facilitate farmer access to inputs, credit, output markets and to improve coordination within the smallholder sector (Tefera et al., 2017).

The formation of agricultural cooperatives has been widely promoted as an agricultural development policy initiative to help smallholder farmers cope with multiple production and marketing challenges (Olagunju et al., 2021; Cishe and Shisanya, 2019). For example, agricultural cooperatives was an integral part of the Ethiopian Growth and Transformation Plan I (GTP I) (2011–2015) and is given high priority to play an important role in strengthening the commercialisation of smallholder agriculture in second Growth and Transformation Plan II (GTP II) (Commission, 2015). This has led to a substantial growth in the number of cooperatives and in the total number of members over the last decade. In Ethiopia, cooperatives (unions and primary cooperatives) have grown substantially in number over the last decade. For instance, from 2008 until 2013, the number of unions grew by 44% (Royer et al., 2017). Due to the importance given to agricultural cooperatives in today's Ethiopia, sustaining the contributions of cooperatives to members and the larger community becomes vital that deserves policymakers' attention.

Despite the crucial roles cooperatives can play in enhancing agricultural and rural developments in developing countries, they are generally characterised by poor performance and impeded growth. The performance and impacts of the agricultural cooperatives in Ethiopia, for instance, is very weak, particularly in creation of robust competitive advantage to smallholder farmers (Bernard et al., 2008, Bernard et al., 2010). Moreover, they suffer from the challenges of poor leadership, limited human capital, low financial means and a rigid institutional environment to assist the needs and priorities of their members. Linking smallholder farmers to input and output markets is one of the main challenges in developing countries. Markets for agricultural inputs, outputs and finance, consumer goods and services are relatively 'thin' (with small volumes traded) and prone to large seasonal variability in supply and demand (Shiferaw et al., 2011).

In the absence of agricultural cooperatives, farmers do not have common standards for selling their products. However, because farmers do not have bargaining power, prices are largely determined by the company and this leads to price undercutting at the farm level (Onyilo and Adong, 2019). Therefore, linking with agricultural cooperatives has an optimistic impact on the welfare of smallholder farmers (Ahmed and Mesfin, 2017). Still, analysis by Ahmed and Mesfin (2017) also indicated that agricultural cooperative member participation has a mixed impact on welfare among its members and non-members. Therefore, reducing the challenges smallholder farmers are facing and improving their agriculture productivity can help to accelerate the agricultural sector and economic development of the country as a whole.

Statement of the problem

The formation of agricultural cooperatives has been widely promoted as an agricultural development policy initiative to help smallholder farmers cope with multiple production and marketing challenges (Olagunju et al., 2021; Cishe and Shisanya, 2019).

In Sub-Sahara African countries where agrarian economies are prevalent, the transformation of smallholder farming is generally viewed as a pre-requisite for economic growth and development (Ayenew, 2016). Hence, effort to improve their living standard highly depends on possibilities of enhancing agricultural productivity. However, smallholder agriculture is burdened with a multitude of challenges including lack of access to finance and markets (CSA, 2016).

Accordingly, study conducted by Mersha and Ayenew (2018) indicated that access to finance and input/output marketing are two of the critical problems affecting the productivity of smallholder agriculture in the country in general and in Oromia regional state in particular.

Several studies also established the positive impacts of cooperatives on the sales and marketing of agricultural produce, improved agricultural technology adoption and household welfare (Nlebem and Raji,

2019; Wossen et al., 2017; Lecoutere, 2017). There are existing studies that have established the importance of rural producer organisations in solving collective farmers' problems such as reducing transaction costs through collective action with specific emphasis on its relevance in developing countries (Ainembabazi et al., 2017).

Barati et al. (2017) posited that despite the crucial roles of the agricultural cooperatives in sustaining the livelihoods of rural communities and fighting poverty, various challenges confront them on their development and limit their potential. Malomane (2019) stated some of the challenges confront agricultural cooperatives as ineffective leadership and governance; a lack of transport and production and marketing infrastructure; group dynamics (conflict); low literacy levels; a lack of access to finance, value adding and processing opportunities and market access; inadequate land; a lack of understanding of the cooperative business model; mismanagement of funds; a lack of financial management; and a lack of extension/technical support.

Hence, agricultural cooperatives in Ethiopia are receiving due attention because of their immense contribution to address the challenge of the people with regard to low level of income, unemployment, poor market for agricultural product, etc. (Srinivasan and Sundaram, 2020).

According to Tadesse and Badiane (2018) agricultural cooperatives in Ethiopia are generally characterised by poor performance and impeded growth. The performance and impacts of the agricultural cooperatives in Ethiopia, for instance, is very weak, particularly in creation of robust competitive advantage to smallholder farmers. Improving agricultural markets is an important area of concern for helping smallholders' commercialisation and ensuring food security. These markets are characterised by complex problems that range from information asymmetry to monopolistic power.

Agricultural cooperatives have not been able to survive in the liberalised market economy and as a result smallholder farmer have limited access to inputs, subsidies, credit and agricultural market service. This led to increased poverty and food insecurity amongst rural smallholders (Onyilo and Adong, 2019). Many of the cooperatives have failed to link farmers to the market and farmers continue to be exploited by middlemen (UNDP, 2016). Onyilo and Adong (2019) also stated that the challenges faced by agricultural cooperatives that negatively impact their performance and survival, such as political interference, lack of administrative support, human resource constraints, inadequate knowledge of the operations by members and poor governance.

In output market, agricultural cooperatives are also participated as a marketing channel. However, due to the relatively loose management structure of agricultural cooperatives, members usually choose to sell only part of their production to agricultural cooperatives and some of them may choose to not use agricultural cooperatives as a marketing channel (Liu et al., 2018).

In Bale zone, there is no research that has been conducted so far. Therefore, there is a knowledge gap relating to whether agricultural cooperatives have a role to play in facilitating and marketing agricultural input and output for smallholder farmers in Bale zone. Based on the gaps in the literature highlighted above, there is a need to assess the contributions of agricultural cooperatives in facilitating and marketing agricultural input and output for smallholder farmers in the study area that helps to sustain the livelihood of smallholder farmers and contribute to economic growth of the country.

Research objectives

General objective of the study

The general aim of the study is to investigate the role of agricultural cooperatives in agricultural input and output marketing in Bale zone.

Specific objectives of the study

- To describe the participation level of agricultural cooperative members in agricultural input-output marketing activities

- To examine the effect of members participation of agricultural cooperative in agricultural input-output marketing activities

- To identify the effect members perception of agricultural cooperatives in agricultural input-output marketing activities in Bale zone.

- To examine the major factors that hinders the performance of agricultural cooperatives in delivering agricultural input-output marketing activities.

Hypotheses of the study

In order to achieve the objective of the study, a number of alternative hypotheses were developed regarding role of agricultural cooperatives in agricultural input and output marketing in Bale zone based on different empirical and theoretical research review made. Generally, there are three testable hypotheses with their sub hypothesis; participation, perception of members and constraints. It is formalised as follows:

Hypothesis A: Member's participation in cooperative affairs have positive and significant role on agricultural input-output marketing.

Hypothesis B: Perception of members

Hypothesis B1: Perception of members on transparency and accountability of cooperatives have positive and significant role on agricultural input-output marketing.

Hypothesis B2: Member's perception of satisfaction on the service rendered through agricultural cooperatives have positive and significant role on agricultural input-output marketing.

Hypothesis B3: Members perception on performance of agricultural cooperative has positive and significant role on agricultural input-output marketing.

Hypothesis C: Constraints that hinder the performance of agricultural cooperatives

Hypothesis C1: Organisational/internal factors have negative and significant impact on agricultural input-output marketing.

Hypothesis C2: External factors have negative and significant impact on agricultural input-output marketing.

Hypothesis C3: Infrastructure factors have negative and significant impact on agricultural input-output marketing.

Significance/importance of the study

The study would play a significant role in providing useful information regarding to agricultural input and output marketing and it will help also to address the needs and problems of the agricultural cooperative members to be benefited from their cooperative organisations and in the livelihood development of smallholder farmers'. The study will further provide recommendations on the success factors for agricultural cooperatives and smallholder farmers to play a meaningful role in rural development. It also helps to the extension workers to come up with some important ideas about agricultural input and output of marketing.

Furthermore, it is anticipated that the outcomes of this study will help the government and other stakeholders that collaborate with the cooperative sector in general and agricultural cooperatives in particular can use this study as an input to design appropriate intervention strategies that drive efficiencies in cooperatives ensuring that they become competitive and contribute to create jobs, eradicate poverty and improve livelihood of rural communities.

Moreover, it will help as an input for researchers for further study who wants to analysis and develop an appropriate agricultural input and output marketing system in relation to agricultural cooperatives and smallholder farmers.

Scope/delimitation of the study

This study is confined to the role of agricultural cooperatives in agricultural input and output marketing in Bale zone. Therefore, the study is purposively conducted by taking agricultural cooperatives found in Sinana, Agarfa, Gasera and Goro districts. The reason for selecting those districts is that there are tough cooperative institutions and they are more potential in facilitating and marketing agricultural input and output. Consequently, this study is focused only the role of agricultural cooperatives in agricultural input and output marketing. Though, the study is based on both primary and secondary sources of data. As a result, out of 87 agricultural cooperatives with a total of 23,653 members, 393 members of agricultural cooperatives were taken as sample respondents for this study.

Limitations of the study

As it is generally known every research study has its own limitations; the following were some of limitations the researcher faced while conducting the study; intensive review of past studies was limited, the sample size used in the research was small. The study is restricted both in space and time. Due to the constraints of resource and time as well as purpose of the study, not all the primary cooperatives involved in agricultural input and output marketing activity found in the study area were covered. The study is confined to rural agricultural cooperatives which are engaged in agricultural input and output marketing. The validity of certain data collected from the cooperative societies and respondents may not be such completely perfect. Even though, the result represents the conditions in Bale zone of Oromia Region, the results cannot be generalised to the whole part of Ethiopia.

Organisation of the paper

The research is focused on five chapters. The first chapter deals the introductory parts which are background, statement of the problem, objective, significance and scope of the study. The second chapter is focus on the review of different literatures related to areas under study. It consists of definition of terms and concepts about digital marketing and destination marketing organisation. The third chapter concentrates on the methodology of the study it consists of research approach and design, sample size, data source and types, data collection procedures and method of data analysis and ethical consideration of the research. The fourth chapter focuses on data analysis and interpretation of the study. And the last chapter (chapter five) includes summary, conclusion and recommendation of the research parts.

Definition of key terms/concepts

Cooperative: A cooperative is defined as a group of individuals with common interest who voluntarily come together to meet their economic, social and cultural needs by having a jointly owned and democratically managed business enterprise.

Agricultural Cooperatives: Agricultural cooperatives are defined as cooperatives whose primary purpose is increasing member and non-member producers' production and incomes by helping better link with finance, agricultural inputs, information and output markets.

Smallholder Farmers: Smallholder farmers are farmers with limited resource endowments relative to other farmers in the sector.

Agricultural Input Marketing: Agricultural input marketing is the process which includes all the activities, arrangements and preparation which assists the farmer in getting his/her required farm inputs. Farm inputs refer to item used in farm production, for example improved seeds fertiliser, improved implements, pesticides and feed.

Agricultural Output Marketing: Marketing of agricultural product or commodity (raw or processed) through cooperative to bring together the relatively small amount produced by individual growers, to sell them to the wholesaler or consumer cooperative or exporter at the best of obtainable price.

Review of Related Literature

Basic concepts and definitions of cooperatives

Cooperation has been the very basis of human civilisation. The inter-dependence and the mutual help among human beings have been the basis of social life (Krishnaswami, 1992). However, modern type of co-operative enterprise has its origins in the 19th century and has become one of the most ever-present example forms of business/economic enterprise.

The word cooperative is derived from the term "cooperation", which means working together. Different authors defined cooperatives in different ways and meanings. For instance, Centre for Cooperatives (2002) defined cooperative as a private business organisation that is owned and controlled by the people who use its products, supplies or services. Although cooperatives vary in type and membership size, all were formed to meet the specific objectives of members and are structured to adapt to members' changing needs.

Bajo et al. (2017) described cooperation as a way to act, an activity and effect, a way of social behaviour and a way to live that entails community relations. Cooperation constitutes one of the fundamental principles in the performance of cooperative organisations.

Cooperatives are an autonomous association of women and men, who unite voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically controlled enterprise (FAO, 2012). Cishe and Shisanya (2019) also defined cooperative as an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically controlled enterprise. Cooperative businesses stabilise communities because they are community-based business anchors; and distribute, recycle and multiply local expertise and capital within a community.

Agricultural cooperatives

Agricultural cooperatives are agricultural-producer-owned coops whose primary purpose is increase member producers' production and incomes by helping better link with finance, agricultural inputs, information and output markets (ATA, 2016).

Agricultural cooperatives have been playing important roles in the socio-economic lives of communities for a long time during which they have also encountered challenges and weaknesses. These have made countries to have their own distinct histories of the development of cooperatives and of course sometimes having similarities (Mojo et al., 2017). Agricultural cooperatives are institutional tools to improve smallholder production performance and thus improving farm income profitability and wellbeing through the improved farm profit (Kayitesi, 2019; Ahmed and Mesfin, 2017).

Cooperatives in general and that of the agricultural cooperatives in particular are established to play significant role in improving access to credit, provide agricultural inputs and create market linkage of smallholder farmers (Mersha and Ayenew, 2018). Other reasons included contributing to economic development and skills development, access to finance, as well as training and capacity development (Malomane, 2019).

Agricultural cooperatives in Ethiopia

In Ethiopia, the cooperative movement starts around 1960s for the essential of versatile activities as creating rural credit, storing and marketing agricultural produces, giving goods and services for production and consumption to the public and increasing saving habits. Because of that "Cooperative Societies' Proclamation" was established in the year of 1974 and promotes commercial crop production in the area of Wollega, Jimma, Agaro, Kafa and Sidamo to earn money and foreign exchange (Srinivasan and

Sundaram, 2020). Cooperatives in Ethiopia is diverse systems and there are different forms of cooperatives are existed as traditional forms of cooperatives such as Debbo, Jiggie or Wonfel, Equib, Eddir, Mahiber and Senbetie which are giving assistant to the employment in the agriculture, input for production and marketing for its produces (Ibid).

Cooperatives in Ethiopia provide assistance mainly in improving access to input and output markets, credit and technologies for enhancing the productivity of smallholder agriculture (Tefera et al., 2017; Srinivasan and Sundaram (2020). This has led to a substantial growth in the number of cooperatives and in the total number of members over the last decade (Royer et al., 2017).

As of 2015, there were 56,044 primary cooperatives, both agricultural and non-agricultural having nine million members throughout the country. Of these, 8,435 primary cooperatives are organised in 309 unions. Agricultural cooperatives, however, only account for about one-fourth of cooperatives in the country. In Oromia region alone there are above 15,492 primary cooperatives, more than 124 cooperative unions and two cooperative federations. One of the objectives of cooperatives specifically agricultural cooperatives is providing or facilitating credit service to their members. Instead of borrowing money and purchase farm equipment, such as tractor and combiner or even complete farm and harvesting equipment; it is sometimes possible to acquire them through lease agreement (Mersha and Ayenew, 2018).

Performance of agricultural cooperatives

Daniel (2006) also used ratios analysis to evaluate performances of cooperatives taking the two years financial data (2001/2 and 2002/3) in the study districts. The liquidity analysis showed that the cooperatives under investigation were below the satisfactory rate. All of the cooperatives under his investigation in the two districts use financial leverage (financed more of their total asset with creditors fund i.e. on average 89.35 per cent of the assets of the cooperatives was financed with creditors fund in the two years). The profitability ratio of the cooperatives under his investigation also showed that the profitability of the cooperatives was weak. All the cooperatives earn return on their asset below the interest rate the financial institution extend credit.

There is well-documented empirical evidence on the roles of agricultural cooperatives in enhancing the adoption of improved agricultural technologies, land management practices, economic performance and welfare of smallholder farmers (Zhang et al., 2019). Even though the cooperatives have some challenges that should be worked on further to solve for more success (Fufa, 2016).

Membership and members' participation

Tesfaye (1995) revealed that producers' cooperatives failed in the past not because of failure inherent in the collective management but because of forced membership without the interest of the farmers and formation of the cooperatives in hurry without any sufficient preparation and feasibility study.

According to the finding of Haileselasie (2003), for example, out of the total respondents, members' participation in the annual meeting was 12.2 percent and 68.8 percent of the total respondents had bought only one share. The result of the study revealed that the overall participation of members in the study area was weak. As a result, the members were not aware of the duties and rights they have in the cooperative societies. Gebru (2006) found out in his study that the participation of women accounts 20-25 per cent in various cooperative types.

Haileselassie (2003) stated that most of the cooperative members appreciated the involvement of cooperatives in input marketing; as a result, members in the Saeisie tsaeda Emba Woreda have built a sense of ownership and confidence. He farther indicated that above all members were satisfied for the reason that it removed the need for members moving along distances to collect fertiliser and reduced time and finance spent on the way.

Role of agricultural cooperatives in agricultural input and output marketing

It is not astonishing that the agricultural cooperatives have a great part in making revenue, giving goods and services at rational price to their members whereas creates employment opportunity to the public of the country. Therefore, agricultural cooperatives have a significant role in poverty alleviation of the country (Srinivasan and Sundaram, 2020).

Cooperatives represent the majority of the farmers, since it is very difficult and highly costly to try to realise the market functions on individual farmer's basis and they systematise agricultural input output marketing. If cooperatives distribute major agricultural commodities directly to the farmer, the channels will be shortened and price decreases, thus, increasing the income (benefit) of farmers. Agricultural marketing and supply cooperative are most important types of cooperatives in Ethiopia, which are principal in rural areas. They are earnings for farmers who want to purchase inputs in bulk and cooperatively sale their crops in order to increase their trading power. The share in chemical, fertilisers, improved seed supply and purchase such collectives reach more than 85% of the total annually distributed (Srinivasan and Sundaram, 2020).

Agricultural inputs can be categorised into two types, consumable and capital inputs. The former includes manures and fertilisers, seeds, insecticides/ pesticides, diesel oil and electricity, etc, on the other hand, capital inputs include tractors and trailers, harvesters and threshers, pump sets and other implements. Most of the agricultural input markets are seen at the level of grain market towns and large villages or cooperative institutions (Singh, 2004).

Cooperatives are increasingly advocated as a means to improve incomes, livelihoods and the sustainability of smallholder farmers (Ofori et al., 2019). Agricultural cooperatives have been identified as an appropriate institution that enables farmers to participate in competitive inputs and output markets, improve the quality and safety of agro-food, adopt advanced technologies, enhance farm economic performance, increase rural household welfare (e.g. Kumar et al., 2016; Ma and Abdulai, 2016; Ma et al., 2018; Wossen et al., 2017).

According to Tumenta et al. (2021), in Cameroon, agricultural cooperatives are actively involved in the production and commercialisation of agricultural products and bulk purchase of inputs such as chemical fertilisers. Cooperatives can also provide credit services to member farmers that ease production constraints (Tefera et al., 2017). Simelane et al. (2019) supported that the role for cooperatives in strengthening rural smallholder farmers, but it also advocates for institutional evolution on cooperatives legislation to enhance their viability and sustainability.

Major constraints in agricultural input and output marketing

The agricultural cooperatives, especially in developing countries like Ethiopia, also present itself as an important element that can contribute to the realisation of the Millennium Development Goals (MDGs). The agricultural markets in Ethiopia are highly influenced by the production system itself. Moreover, the prices of agricultural inputs are increasing from year to year and farmers are complaining on it. If farmers are becoming more efficient to produce their products at lower cost and to sell them at a fair price through agricultural cooperatives, then it would be possible to achieve higher economic growth. Ahmed and Mesfin (2017) confirmed that agricultural cooperatives in Ethiopia provide assistance mainly agricultural farmers' input and marketing for their produces. For instance, in Ethiopia, cooperatives are actively involved in the dissemination of agricultural inputs and about 56% of chemical fertilisers were provided by cooperatives in the 2010 production season (Ibid).

Although cooperatives are considered as an appropriate tool of rural development, they are facing critical problems, which retain them from their positive role. Srinivasan and Sundaram (2020) stated that there is still lack of awareness about cooperatives among stakeholders, policy makers and even community people. There is also poor linkage among cooperatives and other stakeholders. The cooperatives are not getting proper legal support from government and NGOs because of that the cooperatives in Ethiopia indulge in

taxes for their economic activities (Ibid). The agricultural cooperatives in Ethiopia have deficiency of these activities among the people (Srinivasan and Sundaram, 2020).

Chernet and Tirfe (2019) and Yenesew and Debeb (2019) stated that agricultural cooperatives faced many challenges including lack of sense of ownership and lack of follow up and control system by members; lack of commitment, members little awareness about cooperatives, low participation of members in their cooperatives, mistrust; failure of management committee to serve the members' interest; management committees' little knowledge about cooperative proclamations, rules and bylaws, limited training access; limited professional support and follow up to cooperatives; failure to adapt the experience of other model cooperatives; little effort to promote cooperative policies, strategies, proclamations, rules and regulations, lack of commitment to find out the problems of cooperatives; and fail to organise and provide adequate, quality and timely information on cooperatives.

Accordingly, Chernet and Tirfe (2019) revealed that lack of financial resources, lack of market information, poor members' participation and the above mentioned problems place the farmers as usually price takers due to the fact that they have poor marketing skill and limited bargaining power were some of the critical problems facing agricultural cooperatives societies in the Wolaita zone.

Empirical study

The current approach of distribution of seed through farmer's cooperative unions and affiliated primary societies has its own limitation, as procurement of inputs is the responsibility of these cooperatives and unions, which usually have shortage of skilled labour and capacity to handle the process. Moreover, the approach does not create any competition, as the suppliers remain the government enterprise, i.e. Ethiopian seed Enterprise (Yonas, 2003).

Agricultural inputs can be categorised into two types, consumable and capital inputs. The former includes manures and fertilisers, seeds, insecticides/ pesticides, diesel oil and electricity, etc, on the other hand, capital inputs include tractors and trailers, harvesters and threshers, pump sets, 26 and other implements. Most of the agricultural input markets are seen at the level of grain market towns and large villages or cooperative institutions. There are some general aspects of the rural market like underdeveloped markets, illiterate buyers, lack of communication facilities, many languages and vast spread of the market, storage, transport problems, seasonality and demand which are applicable to agricultural input markets as well (Gopalaswamy, 1997 as cited by Singh, 2004). However, agricultural input markets differ from other product markets in many ways due to the nature of their products, the nature and location of users and the overall environment in which products are being bought and used. (Singh, 2004).

Agricultural inputs can be considered to be primarily yield saving or yield enhancing inputs. Their basic usefulness to the farmer and therefore their potential comes fundamentally from the quantity of yield they are able to raise or save. This gives the agronomic potential. They may also help to improve quality. They also help to reduce the uncertainty of obtaining good yields, especially if they are used at the consent or for prevention of disease (Singh, 2004).This study mainly focuses on the agricultural inputs in which the cooperative societies deal up on such as fertilisers, seeds and agro-chemicals, etc. (Gebru, 2007). Agricultural cooperatives are legitimate institutions which belong to farmers. Their main activities are to render variety of services and access the market for input supply particularly to the rural community. He noted that "the trend of agricultural inputs supply in the study area highly decreased in quantity of fertiliser, improved seeds and increased unit price almost from year to year.

Livestock markets in Ethiopia function at three levels consisting of primary, secondary; and terminal markets. Some also include a nominal forth tier at the farm gate level, which could hardly be considered to function as a market. (Solomon, et al, 2000 as cited by Yacob 2002) Primary markets have been identified as only village or also Woreda level markets with a supply of less than 500 head of cattle/week where primary producers (farmers and pastoralists) sell small number of animals to small traders, other farmers (replacement animals), farmer or pastoralist traders and in some cases to consumers and local butchers.

Such markets are not fenced, have no scales and no feeds and watering facilities. Purchasing is done through 'eye ball' negotiations.

The Government of Ethiopia is strongly supporting the restructuring and expansion of the cooperative movement including its involvement in grain marketing. The experience in the past in many countries is that grain marketing cooperatives have to be very efficient to compete with private sector traders when both are on a level playing field. This is mainly because private traders have often been better informed than cooperatives, have been able to respond more rapidly to changing market conditions, make assessments of the risks involved and take rapid decisions based on those assessments (Oxford Policy Management, 2003).

Frank et al. (2003) reported that cooperative marketing societies in India constitute one of the important segments of the agricultural cooperative societies. Cooperative marketing societies render marketing services to the poor and exploited farmers at reasonable cost, assembling, grading, storing, financing, sale and transportation are undertaken by these cooperative marketing societies at a lower cost by eliminating the middlemen. They added that cooperative society is to operate at two levels, viz., input marketing and output marketing .Input marketing includes the purchase and sale of agricultural inputs like seeds, fertilisers and pesticides. Output marketing denotes the purchase and sale of the produce of the member farmers. According to these scholars, a cooperative marketing society, to be successful, must engage in output marketing to the maximum level than the marketing of inputs.

C.M. Muniramappa (as cited by Franck, et al 2003), is one of the pioneers to throw light on this subject. He says, "If a society fails to market the produce of its members or for that matter the produce of any others, it ceases to be of any use to its members for marketing. Many are there just for the name-sake and exist as agents of government for distribution of controlled commodities like wheat, sugar, rice, pulses and production requisites like seeds, fertilisers and pesticides. For all purposes they are either dormant or defunct and can be removed from out of the list of the societies."

Kimberly A. Zeuli and Robert Cropp (2004) Stated that the primary function of marketing cooperatives is to market the products of their members .Beyond that , there is a great range of additional functions the cooperatives in this group perform, bargaining cooperatives(or associations) are at one end of the spectrum. Moreover, they added, in 2002, cooperatives marketed 27% of all farm products in the United States and had a combined net business volume of 569.6 billion US dollar.

A good majority of the livestock markets in Ethiopia belong to this group. Secondary markets are trader and to some extent butcher, breeding and draught stocks and located mainly in regional capitals. Secondary markets serve the local consumers to some extent but mainly feed the terminal markets. These markets also supply live animal exporters and meat processors.

Under the current institutional arrangement, the Ministry of Agriculture and Rural Development (MoARD) is responsible to design, implement and monitor agricultural marketing policies through the different divisions organised under the department of agricultural marketing and inputs of the Ministry. Other organisations like cooperatives, unions, traders' associations, exporters' associations etc also play important role in improving the marketing skill, bargaining power and also in the process of policy formulation. However, under the current situation, they are not strong enough to play the expected role. Thus, it is important that these institutions are strengthened. (Dawit, 2005).

Cooperatives have also found it difficult to retain the 'loyalty' of their members if they can obtain better prices for their grain from alternative outlets. Because of these inherent problems, governments are frequently tempted to tilt the playing field in favour of cooperatives by giving them preferential access to credit facilities and investment grants and/or loans. It is to be hoped that the Government of Ethiopia will not follow this path but rather encourage healthy competition between all participants in the grain marketing system, leading to lower marketing costs that will benefit all of the rural poor, both consumers and producers. There is already considerable support being given to the cooperative movement through

the USAID-funded ACE programme. It would be desirable to undertake a study to assess the need for additional donor funding and technical assistance, bearing in mind the desirability to foster a competitive environment in the grain marketing system on a level playing field.

Kebede (2006) used the logit model to analyse the farmers' perception and determinants of land management practices in Ofla Woreda, southern Tigray, Ethiopia. His findings showed that Age, Sex, Distance to Woreda market, , perceived water logging problem, perceived gully and degradation status, Investment in soil and water conservation practices, slope category were found to determine the farmers perception of land management practice.

Daniel (2006) used the Tobit model to assess the performance of primary agricultural cooperatives and determinants of members' decision to use as marketing agent in Adaa Liben and Lume districts. His finding showed that among these significant variables district, Cooperative price for teff, position in the cooperative, farm size, yield of teff, patronage refund and distance of the district market from the farmer's house were found to be significantly and positively related to the farmers' marketing of teff through the cooperatives. Gizachew (2007) used ratio analysis and found that the liquidity ratios of the cooperatives under his study are fluctuating during the consecutive three years of his study period. This is because of the difference in the amount of the loan from year to year which results for fluctuating in interest payable. Here, the impact of borrowing has shown in decreasing the liquidity ratio. Therefore, cooperatives should increase their capital to minimise a loan.

Conceptual framework of the study
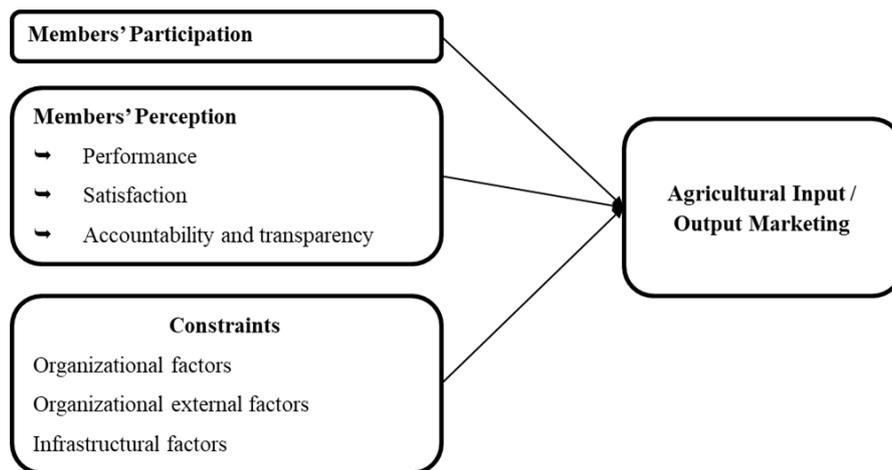
Figure 1: Conceptual framework of the study
Source: Research team's conceptual framework (2023)

Methodology of the Study

Description of the study area

Bale zone is located in south eastern part of Ethiopia, 430 km from the Addis Ababa (Capital city of Ethiopia) with the capital city of Robe. Bale zone is the second largest zone in Oromia National Regional State after Borena zone with a total area of 63,555 km2. It shares about 17.5% of total area of Oromia. Bale is bordered on the south by the Ganale Dorya River which separates it from Guji Zone, on the west by the West Arsi Zone, on the north by Arsi Zone, on the northeast by the Shebelle River which separates it from West Hararghe Zone and East Hararghe Zone and on the east by the Somali Region. Bale zone is one of the 19 zones of the Oromia National Regional State. According to Bale zone Agricultural and Natural Resource Development Office (2014 E.C.), about 90% of the population is dependent on agriculture and 88% lives in rural areas. Altitude of Bale zone extends from less than 300 meters around Meda Welabu, southeast of Rayitu and Gura Damole districts; to more than 4377 meters above sea level in Goba district namely Mount Tulu Dimtu. The annual average temperature of Bale zone is 17.5 °C. The maximum and

minimum temperature is 25 °C and 10 °C respectively. The mean annual average rainfall is 875mm, whereas maximum 1200mm and 550mm minimum annual rainfall was recorded in the zone.

Figure 2: Map of study area

Source: Bale zone administrative office (2013)

Research design and approach

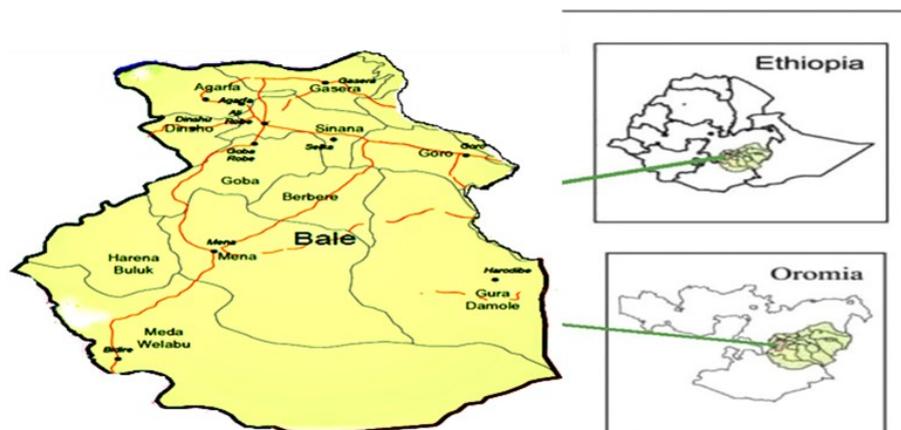The study was employed descriptive and explanatory research design. Descriptive research design is used to describe the data and characteristics about the population or phenomenon being studied, in the form of table and frequency statistics. Explanatory study clarifies the relationship between two aspects of a situation or phenomena (Kumar, 2011). This research design is considered as appropriate because it is suitable in providing a description of the role of agricultural cooperatives in agricultural input and output marketing. And also, the study combined both qualitative and quantitative approaches for the sake of understanding the role of agricultural cooperatives in agricultural input and output marketing.

Type and source of data

Both quantitative and qualitative data types were used by the research team. The qualitative and quantitative data is gathered through primary and secondary data sources.

Population of the study

The target population of this study was comprised 87 agricultural cooperatives from some selected woredas/districts in Bale zone (i.e. 23 from Sinana district, 25 from Gasera district, 22 from Agarefa district and 17 from Goro district). Therefore, target population of the study was 23,653 members of agricultural cooperatives.

Table 1: Target population of the study

Districts	Agricultural Cooperatives	Frequency		Total (Frequency)
		Male	Female	
Sinana	23	8614	598	9212
Gasera	25	4393	428	4821
Agarefa	22	4230	547	4777
Goro	17	4411	432	4843

Source: Researchers' survey, 2023

Sample size determination and sampling technique

The sample respondents for this study were drawn from four purposively selected districts (namely Sinana, Gasera, Agarefa and Goro districts) of Bale zone agricultural cooperatives. Among the seven districts comprising 32,085 cooperative members (SMFCU 2013), these four districts represented a target population of 23,653 members across 87 agricultural cooperatives. A sample of 393 respondents was determined by using the formula of Yamane (1967) at a 95% confidence level and 5% margin of error.

Table 2 shows that the largest proportion of respondents was drawn from Sinana district (153), followed by Goro (81), Gasera (80), and Agarefa (79). The distribution of respondents across districts is proportionate to their respective cooperative membership sizes, ensuring balanced representation and minimising sampling bias. This proportional allocation enhances the representativeness, reliability and generalisability of the study findings across the selected districts.

Table 2: Total sample respondents

District	Frequency		Total (Frequency)	Proportion Sample Size
	Male	Female		
Sinana	8614	598	9212	153
Gasera	4393	428	4821	80
Agarefa	4230	547	4777	79
Goro	4411	432	4843	81

Source: Researchers' survey, 2023

Method of data collection

The data collection tools to be used in this research as the primary data collection instrument are both open and close ended questionnaire and semi-structured interview. Accordingly, both open and close ended questionnaire was prepared and distributed for agricultural cooperatives members. Pilot study is conducted by testing and pre-testing the questionnaire with 30 randomly selected agricultural cooperative members. Feedbacks was incorporated and questions revised. The questionnaire that was prepare and translated in to the local language (Afan Oromo language). Hence, semi-structured interview was conducted with 20 managers of agricultural cooperative.

The information required with regard to secondary data is gathered from the agricultural cooperatives including: both financial and physical quantity of purchased and sold of agricultural input/output, recording of activities, data related to production, purchases, sales, members, assets, credits disbursed and collected, employees, profits/losses. Accordingly, 4 numerators were recruited for data collection.

Research validity and reliability

Validity is the degree by which the sample of test items represents the content of test is designed to measure (Heale & Twycross, 2015). Content validity that was employed by this study is a measure of the degree to which data were collected through questionnaires. The instrument validity is checked by represent a specific domain or content of a particular concept and experts in the field of research evaluated it.

According to Phelan and Wren (2005), reliability is the degree to which an assessment tool produces stable and consistent results. An instrument is reliable when it measures a variable accurately and obtains similar results under the same conditions over a period of time. Therefore, the study illustrates on every feature of the study. The study collected several types of information from different sources that could improve the reliability of the data and its results. The instrument was calculated by finding Cronbach's alpha coefficient. Cronbach's alpha is an index of reliability associated with calculating the reliability of items that are not scored right versus wrong (Fraenkel & Wallen, 2003).

Besides, the reliability concerns the extent to which a measurement of a phenomenon provides stable and consist result (Carmines & Zeller, 1979). Otherwise, it is all about the consistency of the result (Taherdoost, 2016) to measure inter-item homogeneity of each construct using Cronbach's alpha value greater than or equal to .70 (Cronbach & Warrington, 1951) and the inter-item correlations were greater than or equal to .30 (Tavakol & Dennick, 2011) were included to collect data and included in the analysis. Besides, Sharma (2016) classified the reliability statistics depending on the Cronbach's alpha value: $\alpha \geq .90$=Excellent, $.90 > \alpha \geq .80$=Good, $.80 > \alpha \geq .70$=Acceptable, $.70 > \alpha \geq .60$=Questionable, $.60 > \alpha \geq .50$=Poor and $\alpha < .50$=Unacceptable.

In the current study, the reliability of the survey instruments was estimated based on Cronbach's alpha measure of internal consistency as indicated in the table below. Fortunately, the result of the pilot survey

exhibited no variable was found below .70. The reliability analysis revealed the Cronbach's alpha coefficient that exhibited the consistency of the results that ranges from .738 to .876 that made the result acceptable based on (Tavakol & Dennick, 2011; Cronbach & Warrington, 195).

Table 3: Reliability analysis using Cronbach's alpha

	Variables	Cronbach's alpha	Total number of tested items
Independent variables	Members perception on cooperatives performance	.899	6
	Perception on accountability and transparency	.745	5
	Perception on satisfaction	.774	6
	Members participation	.889	8
	Infrastructural factors	.731	7
	Organisational problem	.664	8
	External problem	.850	6
Dependent variables	Agricultural input output marketing	.883	7

Source: Researchers' survey, 2023

Method of data analysis

Structural equation modelling using AMOS version 23.0 was employed for data analysis. (SEM) model applied to test the conceptual model and examine the relationships between each pairs of variables as suggested in the hypothesis. Structural equation modelling (SEM) refers to a statistical method used to measure and analyse the relationship of observed and latent variables. It is similar but more powerful than regression analyses; it examines linear causal relationship among variables, while simultaneously accounting for measurement error (Tanya and Claudio, 2010).

Path analysis, on the other hand, had its beginning in biometrics and aimed to find the causal relationship among variables by creating a path diagram (Wright, 1918; 1920, 1921 as cited in Fan et al., 2016). It was the early name for SEM before there were latent variables and was very powerful in testing and developing the structural hypothesis with both indirect and direct causal effects. Path analysis can explain the causal relationships among variables. A common function of path analysis is mediation, which assumes that a variable can influence an outcome directly and indirectly through another variable (Shao et al., 2016) Path analysis developed to quantify the relationships among multiple variables (Wright, 1921 as cited in Fan et al., 2016). Therefore, in this study the structural equation modelling of path analysis was employed to test the effect of each of the determinant factors on agricultural input and output marketing through testing the formulated hypotheses. The questionnaires were collected manually from the sample respondents and the responses was coded and entered into the statistical software Statistical Package for Social Scientists (SPSS) Version 26 to make a clear recording of data. The statistical software was helped to analyse and present the data through the statistical tools that includes descriptive analysis (frequencies, mean, standard deviation and percentages).

Model specification

Descriptive statistics was used to analysis demographic profile of population and general information by using SPSS v26.0 statistical tools. Frequencies and percentages were used to analyse demographic and general information of the respondents.

In order to examine the effect and relationship between agricultural cooperatives and agricultural input-output marketing the explanatory variables, structural equation model (SEM) is used. The path analysis takes place using SPSS and AMOS. The data imported from SPSS to AMOS for testing each hypothesis and research objectives. The model was adopted from different studies conducted on the topic area.

Variable description and their expected sign

Table 4: Summary of variables measurement, symbols and expected results

Variables	Symbol	Measurement of Variable	
Members perception on cooperatives Performance	PER	variable measured by five-point Likert scale	+/-
Members Perception on accountability and transparency	ATT	variable measured by five-point Likert scale	+/-
Members Perception of satisfaction	SATI	variable measured by five-point Likert scale	+/-
Members participation	PART	variable measured by five-point Likert scale	+/-
Infrastructural factors	IPR	variable measured by five-point Likert scale	+/-
Organisational factors	OPR	variable measured by five-point Likert scale	+/-
External factors	EPR	variable measured by five-point Likert scale	+/-
Agricultural input output marketing	IO	variable measured by five-point Likert scale	+/-

Source: Researchers' field survey, 2023

Ethical consideration and confidentiality

Researchers are professionals; hence, research ethics as a branch of applied ethics has well established rules and guidelines that define their conduct (Ifedha and Bretta, 2016). The study conducted by considering appropriate ethical principles. In this study, the researcher had letter of cooperation request from Maddawalabu University to agricultural cooperatives and then to approach targeted the study area for data collection. The objectives of the study were made clear for the respondents and their consent has been considered in the current study. Moreover, no information modified or changed and the sources of data used for this study were properly acknowledged and cited.

Results and Discussion

Introduction

This chapter focuses on the analysis and interpretation of the data collected through questionnaires. For clarity purpose first, the result of descriptive analysis is presented. In descriptive statistics data was analysed using frequency, percentage, mean and standard deviation were used to aid the analysis of data because they are effective illustrations of depicting relations and trends.

Response rate

To achieve the objective of the research, 393 sample respondents were selected from four woredas (namely Sinana, Gasera, Agarefa and Goro districts) of Bale zone agricultural cooperatives by using Yemane's formula. Out of the total of 393 questionnaires distributed, 340 complete and valid responses were obtained and used for data analysis and interpretation, yielding a response rate of 86.5%.

Descriptive statistics

Demographic characteristics of the respondents

Table 5: Demographic characteristics of the respondents

Variables	Category	Frequency	Percent
Gender	Male	275	80.9
	Female	39	19.1
Age	21-30	170	50
	31-40	107	31.5
	41-50	24	7.1
	>50	39	11.5
Educational Level	Illiterate	49	14.4
	Read and Write	87	25.6
	Primary school	71	20.9
	High school	96	28.2
	Diploma	13	3.8
	Certificate	24	7.1
Marital Status	Married	308	90.6

Variables	Category	Frequency	Percent
	Single	8	2.4
	Widowed	15	4.4
	Divorced	9	2.6
Family Size	0	9	2.6
	1 up to 5	159	46.8
	6 up to 10	172	50.6

Source: Researchers' survey, 2023

Sex of Respondents: The above table shows that among the total number of respondents 275 (80.9%) are male and 39 (19.1%) of the total respondents are female. It can be said that the number of male agricultural cooperative members are by 61.8% higher than female members. The implication of this result is that even though the same minimum requirement of membership is required for both men and women, households in the study area were dominantly men headed and male members outweigh female members of cooperative.

Age group of sample household heads: Age of the farmers measured in years is one of the characteristics that is worth mentioned in literature which affect farmers' economic participation in cooperatives. In this study, it was assumed that the age of household head influences the farmers' engagement in input output marketing of cooperatives. It is generally expected that older farmers would manifest better experience and innovation skill than their younger counterparts as they have more experience on the challenges and opportunities for agricultural productivity (Semeneh, 2010). Based on the data of response group 170 (11.5%) of the population belongs to the age group 21-30 years, 107 (50.0%) belong to the age group of 31-40 years, 24 (31.5%) belong to age group 41-50 years and 39 (7.1%) of the population belongs to 50 and above age groups. This is an indication that majority of the respondent's heads in the study area were in their young and mid years with few of them who could be considered as old.

Educational level of households: Since the households with some basic education knowledge might better get and process information about improved technology. Hence, education would have clear implication to both membership and productivity of cooperative members. This is because education has more to do with farmers' awareness and sensitivity to input output marketing of cooperatives in era of inflation, competition and vulnerability to market shocks. The levels of educational background were varying among study participants. Almost 96(28.2%) of the respondents have attained High school, 13 (3.8%) have achieved diploma, 71 (20.9%) have attained Primary school, 49 (14.4%) respondents are Illiterate, 87 (25.6%) of respondents are Read and Write and 24 (7.1%) of the respondents are achieved Certificate. This indicates that members were predominantly could have basic reading, writing, computing and communication skills.

Looking at marital status of households, 8(2.4%) was single, 308 (90.6%) were married, 15 (4.4%) Widowed and 9 (2.6%) were divorced.

Finally, out of 340 sample cooperative members, more than half 172(50.6%) and 159(46.8%) of them had 6-10 and 1-5 family members respectively and 9 (2.6%) of the respondents are zero family size.

Income of members

Table 6: Income and expenditure of members

Variables	Category	Frequency	Percent	Mean	Std. Deviation
Major sources of income	Sale of cereals and pulses	337	99.1	1.02	.187
	Sale of vegetables and fruits	3	0.9		
	Sale of livestock	0	.00		
	Others	0	.00		
Do you have off/non-farm income	Yes	0	.00	2.00	.000
	No	340	100.0		
Your income source from on-farm activities in the year 2014 E.C. in birr.	51000-100000	53	15.6	3.1118	.70345
	101000-150000	210	61.8		
	151000-200000	63	18.5		

Variables	Category	Frequency	Percent	Mean	Std. Deviation
	>200000	14	4.1		

Source: Researchers' survey, 2023

As per the table, 99.1% and 0.9% of respondents obtain their income through sale of cereals and pulses and Sale of vegetables and fruits respectively. The table shows the sales of cereals and pulses activities are consider as major sources of the income (99.1%). Cooperative and professional should participate in enhancing productivity of cereals and pulses to increase their income.

According to the respondent's response, the communities have not non-farm income (100%). On the other hand, the community economic is depended only in the farm activity. The government and other stakeholders should create awareness to the local communities about the role and significance of cooperative in farming activity.

The result indicates 61.8% of respondents 101000-150000, 18.5% 151000-200000 and 15.6% of respondents were in the 51000-100000 response categories. The remaining were in the>200000 (4%). The result also indicates that the majority of the respondents respond their last year annual income is between 101000- 150000 which is categorised under middle income but, because of family size and different farming activity cost they become fall under low earn society.

Members farming characteristics and agricultural activities

Table 7: Members' farming characteristics and agricultural activities

Variables	Category	Frequency	Percent	Mean	Std. Deviation
Farming experience in full years	1 up to 2	0	.00	2.89	.319
	3 up to 4	39	11.5		
	5 and above	301	88.5		
Do you own land	Yes	340	100.0	1.0000	.00000
	No	0	.00		
How do see the fertility status and soil character of your plot	Good	103	30.3	1.7088	.48021
	Medium	233	68.5		
	Poor	4	1.2		

Source: Researchers' survey, 2023

Concerning farming experience, 301 (88.5%) of the respondents confirmed that 5 years and above experience, while 39 (11.5%) are 3 up to 4 years and there is no 1 up to 2 years. This shows that the majority of the agricultural cooperatives have experience on agricultural activities. Although, all of the members have their own land 340(100%). They see the fertility status and soil character of the plot as good, medium and poor with the percent of 103 (30.3%), 233 68.5(%) and 4 (1.2%), respectively.

Access to input supply and output marketing service with its members

Table 8: Access to input supply and output marketing service with its members

Variables	Category	Frequency	Percent	Mean	Std. Deviation
Did you involve in purchasing agricultural input from the agricultural cooperatives	Yes	340	100.0	1.0000	.00000
	No	0	.00		
What type of agricultural inputs currently you get from the agricultural cooperatives	Soil Fertiliser	163	47.9	1.9824	1.18234
	Chemicals	97	28.5		
	Commodities	3	.9		
	Improved seeds	77	22.6		
Are you able to get all the agricultural inputs from your cooperative society on correct time and quantity	Yes	87	25.6	1.7441	.43700
	No	253	74.4		
Do you sell your agricultural products to the agricultural cooperatives	Yes	340	100.0	1.0000	.00000
	No	0	.00		
From where do you get information about the market price of agricultural product	Local market	127	37.4	3.1735	3.15703
	Cooperative promoter	18	5.3		

Variables	Category	Frequency	Percent	Mean	Std. Deviation
	Retailers	49	14.4		
	Extension workers/development agent	7	2.1		
	Wholesalers	138	40.6		
	Others	1	.3		
How do you see the pricing strategy of the agricultural cooperatives in input/output marketing	Poor	40	11.8	2.4765	.72627
	No difference	105	30.9		
	Reasonable	188	55.3		
	Attractive/Very good	7	2.1		

Source: Researchers' survey, 2023

Although all of the members were involved in purchasing agricultural input from the cooperative 340 (100%). This finding contradicts with (Hussi et al., 1993), especially agricultural cooperatives, provide their members with the advantages of economies of scale by combining their resources, producers can obtain the needed goods and services more efficiently and market them in the larger volume, thus giving them a stronger bargaining position in dealing with traders and processors.

The type of input provided to farmers through cooperatives solely were soil fertiliser, chemicals, commodities and improved seeds in order of importance (47.9%, 28.5%, 0.9% and 22.6%) respectively. This finding coincides with (Hussi et al, 1993) that cooperatives could serve their members by providing agricultural supplies and bargaining their produces to the market. The main types of agricultural inputs provided through cooperatives to member farmers were hence, soil fertiliser, chemicals and selected seeds.

The main advantages of buying items from cooperatives over private businesses were relatively cheaper price and correct measurement of items. In contrast to this more than half, 253 (74.4%) witnessed that they were not able to get all the agricultural inputs from their cooperative society on the right time and at the required quantity. Nearly a comparable number of them 87 (25.6%)), however confirmed that they were able to get all the agricultural inputs from their cooperative society on the right time and at the required quantity. Therefore, it can be inferred farmers were not getting all the agricultural inputs from their cooperative society on the right time and at the required quantity though their need of agricultural input differs according to the type of crop they grow.

All of the members were selling their agricultural products to the agricultural cooperatives 340 (100%). This implies that all the agricultural members benefited from the agricultural cooperatives.

Out of 340 sample cooperative members, their source of information about the market price of agricultural product were local market, cooperative promoter, retailers, extension workers/development agent, wholesalers and others with percent of 127 (37.4%), 18 (5.3%), 49 (14.4%), 7 (2.1%) and 1 (0.3%) respectively. These shows that the majority of the respondents 37.4% get information about the market price of agricultural product is from local market.

Concerning pricing strategy, 188 (55.3%) of the respondents confirmed that the pricing strategy of the cooperatives in input/output marketing was reasonable while 40 (11.8%), 105 (30.9%) and 7 (2.1%) of them evaluated it as poor, no difference and attractive/very good respectively.

Members credit using pattern and cooperative credit services

Table 9: Members' credit using pattern and cooperative credit services

Variables	Category	Frequency	Percent	Mean	Std. Deviation
Did you borrow money from the agricultural cooperative to access agricultural input	Yes	340	100.0	1.0000	.00000
	No	0	.00		
For what purpose do you borrow money from	Purchase of fertiliser	164	48.2	2.0088	1.20590
	Purchase of chemicals	90	26.5		
	Purchase of farm implements	5	1.5		

Variables	Category	Frequency	Percent	Mean	Std. Deviation
your agricultural cooperative	Purchase of farm implements	81	23.8		
Why do you prefer to borrow and purchase input in loan from the cooperative	Less security is required	43	12.6		
	Easier to get loan	165	48.5		
	Cheapest source of credit that could be found	6	1.8	2.6324	1.10915
	Possibility of getting on time	126	37.1		

Source: Researchers' survey, 2023

The above table shows that all of the members were get borrow money from the agricultural cooperative to access agricultural input 340(100%). Their purpose of borrow money from agricultural cooperative is purchase of fertiliser, purchase of chemicals, purchase of farm implements and purchase of farm implements, with the percent of 164 (48.2%), 90 (26.5%), 5 (1.5%) and 81 (23.8%) respectively. Their reasons to borrow and purchase input in loan from the cooperative were less security is required 43 (12.6%), easier to get loan 165 (48.5%), cheapest source of credit that could be found 6(1.8%) and possibility of getting on time 126 (37.1%). This implies that members of agricultural cooperatives are mostly prefer those agricultural cooperatives because of the possibility of getting loan.

Membership duration and condition

Table 10: Membership duration and condition

Variables	Category	Frequency	Percent	Mean	Std. Deviation
How long have you been a member of this cooperative	2	4	1.2		
	3	19	5.6		
	4	26	7.6		
	5	65	19.1		
	6	86	25.3	6.32	1.834
	7	40	11.8		
	8	59	17.4		
	9	23	6.8		
	10	18	5.3		
How do you become a member of the cooperative	On own interest and free choice	42	12.4		
	Awareness by promoters	58	17.1		
	Friends influence	75	22.1	3.2294	1.25989
	Influenced by neighbours	110	32.4		
	Looking for service rendered by the cooperatives	55	16.2		
What was your purpose of joining the agricultural cooperative	To get training from my cooperative	8	2.4		
	To get credit service	16	4.7		
	To get market stabilisation	74	21.8	4.7794	1.09767
	To get agricultural inputs supply	163	47.9		
	To get agricultural output marketing service	79	23.2		

Source: Researchers' survey, 2023

The large majority of the respondents have been a member of the cooperative for six years (25.3%) followed by five years (19.1%). The remaining respondents consist of 17.4%, 11.8%, 7.6%, 6.8%, 5.6%, 5.3% and 1.2% of respondents have been members of the cooperative , 8,7,4,9,3,10 and 2 years respectively. This implies that majority of respondents are more experienced about the cooperative condition.

As per the tables above, the majorities of respondents are influenced by neighbours 32.4%, friends influence 22.1%, Awareness by promotes 17.1%, 9.6 , 16.2% looking for service rendered by the cooperatives and 12.4 % On own interest and free choice respectively on the issue about the how they become a member of the cooperative This shows, member have awareness about the role of cooperative and they influence their neighbours and friends become the part of cooperative benefit.

As depicted in table , 47.9%, 23.2% , 21.8% and 4.7of respondents to get agricultural inputs supply, to get agricultural output marketing service, to get market stabilisation and to get credit service respectively. The rest 2.4 % are to get training from cooperative. These indicate that members of cooperative joined increase their productive live by get agricultural input supply and output marketing service.

Inferential statistics results

The analysis starts with presenting the correlation between variables in the model. The result of the correlation coefficients indicates how strong or weak the relationship is between variables concerned. Then the inferential statistics presents the structural equation modelling results obtained from the Amos 23 outputs. These data describe the casual relations between and among the exogenous variable and the endogenous variables.

Correlation analysis

It is common in most studies to make correlation analysis among variables before going to do detailed regression analysis. Correlation analysis is used to identify the direction of the relationship between two variables and to measure the degree of association between them. The value of correlation lies between +1 and -1. A correlation coefficient close to either –1 or +1 indicates that there was a strong inverse or direct relationship between variables respectively; whereas a correlation coefficient of zero indicates that the variables are uncorrelated. Correlation analysis was conducted in this section to analyse and examine the relationship between variables and to provide evidence of construct validity. As it is indicated in the above table, positive relationship was found among the majority of independent (explanatory) variables. Except perception of members on transparency and accountability of cooperatives and organisational/internal factors, perception of members on transparency and accountability of cooperatives and infrastructure factors and perception of members on transparency and accountability of cooperatives and members perception on performance of agricultural cooperative. However, the majority variables have a very strong positive relationship with each other. It means that, the majority variables determine agricultural input-output marketing.

Table 11: Summary of correlations results

Path/Effects			Estimate	Path/Effects			Estimate
PER	<-->	EPR	.899	ATT	<-->	EPR	-.002
ATT	<-->	OPR	-.007	PER	<-->	OPR	.775
PART	<-->	OPR	.874	PER	<-->	IPR	.774
IPR	<-->	OPR	.851	PER	<-->	PART	.804
ATT	<-->	IPR	-.012	PER	<-->	SATI	.910
SATI	<-->	IPR	.874	SATI	<-->	OPR	.851
PART	<-->	IPR	.833	OPR	<-->	EPR	.752
ATT	<-->	PART	.012	SATI	<-->	PART	.851
IPR	<-->	EPR	.777	PER	<-->	ATT	.020
PART	<-->	EPR	.844	ATT	<-->	SATI	.012
SATI	<-->	EPR	.856				

Source: Researchers' survey, 2023

Normality of data and multivariate analysis

In structural equation modelling, the most important assumption is testing normality and multivariate analysis. Therefore, the researcher has employed structural equation model, path analyses to check the normality of the data collected. To begin with, the analytical way of normality test, descriptive statistics were produced. Skewness and kurtosis were used to determine whether a data set is normally distributed or not and to judge the normality of the data. Though, normally distributed has both Skewness and kurtosis value between -2 to +2 is accepted (George & Mallery, 2010). It can be noted in the table that the value of skewness and kurtosis fall within the acceptable range of -2 to +2 and it indicate that the data is fairly normal and the basic the assumption normality testing is fulfilled.

Multivariate analysis is a process of involving multiple variables resulting in one outcome. MVA is a statistical procedure for analysis of data involving more than one type of measurement or observation and it may mean solving problems where more than one variable is analysed simultaneously with other variables. According to the rule of thumb, the range of acceptance for multivariate analysis is between -1.96 to 1.96 (GLT, 2020). Thus, the table below indicates that the result is found between the range of acceptance and it is accepted.

Table 12: Assessment of normality and multivariate results

Variables	Min	Max	Skew	C.R.	Kurtosis	C.R.
External factors	6.000	30.000	-.373	-2.718	-1.144	-4.164
Organisational factors	8.000	26.000	-.703	-5.121	-.503	-1.829
Infrastructural challenges	7.000	28.000	-.932	-6.785	.766	2.787
Participation	8.000	40.000	-.964	-7.016	.009	.032
Satisfaction	6.000	24.000	-.423	-3.082	-.916	-3.335
Accountability and transparency	5.000	25.000	-1.012	-7.368	.013	.047
Performance	6.000	26.000	-.485	-3.528	-1.410	-5.132
Input/output	7.000	30.000	-.454	-3.305	-1.391	-5.062
Multivariate					1.786	1.225

Source: Researchers' survey, 2023

Model fit indexes

Table 13 provides a summary of the key measures of fit for each of the constructs in the model estimated by Maximum Likelihood Estimates. Hair et al. (2010) suggest that researchers should provide a minimum of "one absolute fit index and one incremental fit index and that three to five fit indexes provide adequate evidence of model fit. Furthermore, Kline (1998) also suggests the inclusion of a fit index that adjusts the explained variance for the model's degree of complexity.

Accordingly, it is possible to use three to four fit indexes as mentioned by the above authors, however the researcher uses fit indexes including the suggested incremental fit index (IFI), absolute fit index (CFI) and root mean square error residual (RMSEA), goodness of fit indexes (GFI) and absolute fit indexes (AGFI). Hence, this model is fit for the analysis as indicated in the table below. The hypothesised relationships were tested using SEM AMOS V23 on SPSS v26. According to Yuan (2005), fit indices are classified based on their distributional assumptions. For instance, in convenience, we classify fit indices in four categories as follows: first, independent model based; secondly, root mean square error of approximation; thirdly, residual based and lastly; information criterion based fit indices.

CMIN/DF is a parsimonious conformity index that measures the goodness of fit of the model with the estimated coefficients to achieve conformity. The result of CMIN/DF in this study is 2.602, indicating that the research model fits from the threshold of less than 3 (Marsh et al., 1988). This value is used to compare whether the observed variables and expected results are statistically significant.

The Goodness of Fit Index (GFI) shows the overall level of conformity calculated from the residual square of the model predicted compared to the actual data. The GFI value in this model is 0.994. The approximate value with the recommended level is higher than 0.90 (Mulaik et al 1989).

RMSEA is an index used to compensate for the chi-square value in a large sample. The RMSEA value of this study was 0.066 with the recommended value of <0.08, showing the fit research model (Browne & Cudeck 1993).

AGFI is GFI, which is adjusted to the ratio between the degree of freedom that is proposed and the degree of freedom from the null model. The AGFI value in this model is 0.944. The approximate value with the recommended level should be higher than 0.9, indicating the fit of the research model (Mulaik et al 1989).

The CFI value in this study is 0.998, with a recommended value higher than 0.9 indicating a fit research model (Bentler, 1992). The NFI value in this study is 0.998, with a recommended value higher than 0.9 indicating a fit research model (Bentler, 1992). The IFI value in this study is 0.999, with a recommended

value higher than 0.9 indicating a fit research model (Hu and Bentler 1999). All values meet the criterion of preferable values. The hypothesised relationships were tested using SEM AMOS v23 on SPSS v26. Overall, the fit indices indicated that the proposed structural model fits the data reasonably well. All values meet the criterion of preferable values. Therefore, the model is found to be fitted for goodness and hence the analysis was done accordingly.

Table 13: Model goodness fitting test

Model Goodness Fitting	Recommended Value	Research Model	Model
CMIN/DF	<3	.105	Fit
GFI	>0.9	1.00	Fit
AGFI	>0.9	0.997	Fit
RMSEA	<0.08	0.066	Fit
NFI	>0.9	1.00	Fit
CFI	>0.9	1.00	Fit
IFI	>0.9	1.00	Fit

Source: Researchers' survey, 2023

Maximum likelihood estimates

Maximum likelihood estimation (MLE) is by far the most common method and literatures recommend that unless the researcher has good reason, this default should be taken. MLE makes estimation based on maximising the probability (likelihood) that the observed covariance are drawn from a population assumed to be the same as that reflected in the coefficient estimates. That is, MLE picks estimates, which have the greatest chance of reproducing the observed data. In connection to this, the following regression estimates were obtained from my analysis.

Modification indexes (MI) may be used to add arrows to the model. The larger the modification indexes, the more arrows will be added to the model, which will improve the model fit (Nora, 2004). Therefore, the researcher used modification indices to get good fitness indexes though adding the both sharpen arrows. (Figure 3).
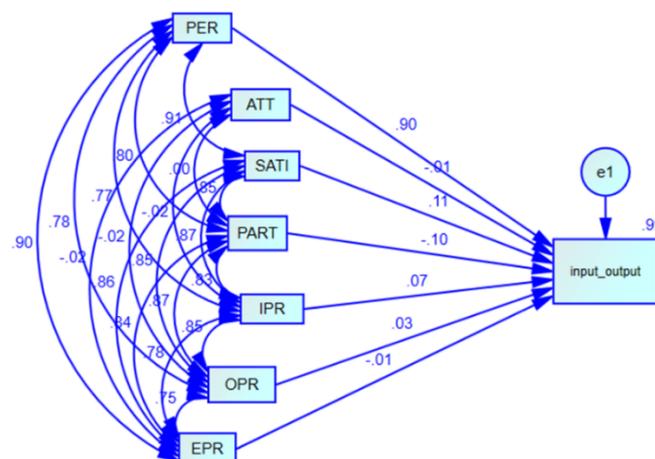

Figure 3: Model fit and research model
Source: Researchers' survey, 2023

Path analysis

Path analysis is an extension of multiple regression that allows us to examine more complicated relations among the variables that having several independent variables predict one dependent variables and to compare different models against one another to see which one best fits the data (Psychiatry, 2005). Path analysis is based on a closed system of nested relationships among variables that are represented statistically by a series of structured multiple regression equations (Colombia public health, 2022). Wright (1934, as cited in Valenzuela, & Bachmann, 2017) describe path analysis as a system of correlation coefficients, path

analysis is now regarded as one type of the more general statistical technique known as structural equation modelling (SEM).

Interpretation of beta value

Since the SEM employed for standardised regression on path analysis, the beta coefficient of each independent variable on the dependent variable is not constant and it depends on the value of the independent variables. Thus, the coefficient can be a means for summarising how a change in response is related to a change in a covariate. For continuous variables, the coefficients of discrete changes are continuous, for continuous independent variables, the coefficient indicates when the unit change in the independent variable leads to an increase in the probability of input and output marketing in this study.

The value of β is used to show which independent variable is the most predictor of the dependent variable. According to Zikmund et al., (2010) the advantage of β is to provide a constant scale and that the βs are comparable, that the greater the value of standardised regression coefficient the more the independent variable explains the dependent variable. A standard coefficient beta was used to determine the strong predictor of agricultural input and output marketing from independent variables. The standardised beta coefficients give a measure of the contribution of each variable to the model. A large value indicates that a unit change in this predictor variable has a large effect on the dependent variable. In the following section, the regression result of each explanatory variable is individually discussed to test the hypotheses of the study and reach conclusion in the general model.

R^2 values (squared multiple correlation)

In structural equation model, R^2 is known as squared multiple correlations (SMC) which indicates the variance level reflected by predictors of the factors in question. Having minimum value of 0.409 and maximum value 0.8 in SMC analysis it can be taken as general predictors explain respective variable (Byrne, 2010). Therefore, on this study the exogenous variables outstandingly explain the endogenous variable as shown in Table 14.

Table 14: R^2 Value

Endogenous variables	R2 (SMC) Value
Input/output market	.82

Source: Researchers' survey, 2023

Hypothesis testing

Hypothesis testing is used to address the study's objectives and to assess the relationships between structural models. Table 15 illustrates the analysis of the data hypotheses using the value of the standardised regression weight, which indicates the coefficient of effect between variables.

According to the results from the regression paths of the hypothesis development shown in Table 15, Hypothesis A: Members participation in cooperative affairs have positive and significant role on input-output marketing, which is rejected thus, the null hypothesis is accepted (t=-7.598, β=-.101, p=<001). Hypothesis B1 Perception of members on transparency and accountability have positive and significant role on input-output marketing, which is rejected thus, the null hypothesis is accepted (t=-1.91., β=-.010, p=05). Hypothesis B2: Perception of members satisfaction on the service rendered have positive and significant role on input-output marketing, which is accepted, thus, the null hypothesis is accepted (t=-6.666, β=.112, p=<001). Hypothesis B3: performance of agricultural cooperative have positive and significant role on input-output marketing, which is accepted, thus, the null hypothesis is accepted (t=58.781, β=0.901, p=<001).

Members participation in cooperative affairs have positive and significant role on input-output marketing, which is accepted thus, the null hypothesis is accepted (t=7.598, β=.101, p=<001). Hypothesis C1: Infrastructure problem have negative and significant role on input-output marketing, which is rejected thus, the null hypothesis is accepted (t=5.929, β=.071, p=<001). Hypothesis C2: Organisational/internal

problems have negative and significant role on input-output marketing, which is rejected thus, the null hypothesis is accepted (t=2.684, β=.033, p=<007). Hypothesis C3: External problems have negative and significant role on input-output marketing, which is accepted thus, the null hypothesis is accepted (t=-.784, β=-.011, p=<001).

Table 15: Path coefficients and hypothesis testing

Hypothesis	Path/Effect	β -value	Standard error	t-value	P	Results
HA	PART ----> input_output	.101	.012	-7.598	***	Accepted
HB1	PER ----> input_output	.901	.016	58.781	***	Accepted
HB2	ATT ----> input_output	-.010	.008	-1.913	.05	Rejected
HB3	SATI ----> input_output	.112	.026	6.666	***	Accepted
HC1	IPR ----> input_output	.071	.018	5.929	***	Rejected
HC2	OPR----> input_output	.033	.021	2.684	.007	Rejected
HC3	EPR----> input_output	-.011	.015	-.784	***	Accepted

Source: Researchers' survey, 2023

*** Significant at p<0.001; **Significant at p<0.01, * Significant at p<0.05
NB: PER (Performance), ATT (Accountability and Transparency), SATI (Satisfaction), PART (Participation), IPR (Infrastructural factors), OPR (Organisational factors), EPR (External factors).

Discussion

Income and expenditure of members

Table 6 shows the sales of cereals and pulses activities are considered as major sources of the income 99.1% Cooperative and professional should participate in enhancing productivity of cereals and pulses to increase their income. This report provides an analysis of the critical role of pulses and cereals in agricultural production as a driver for economic growth and food security. This finding contradicts with (Gezahegn A. and Dawit A 2006) sales of cereals and pulses, which occupy approximately 13 percent of cultivated land and account for approximately ten percent of the agricultural value addition, are critical to smallholder livelihoods in Ethiopia. On the other hand, the community economic is depended only in the farm activity. The government and other stakeholders should create awareness to the local communities about the role and significance of cooperative in farming activity. This finding support with (Michael S. 2020) Agricultural cooperative aims to increase members' production and incomes by helping better link them with finance, agricultural inputs and information and output markets. It also helps farmers' benefits from economies of scale to lower their costs to acquiring inputs or hiring services such as storage and transport, enables farmers to improve product and service quality and reduce risks. Their annual income also indicates that the majority of the respondents respond their last year annual income is between 101000- 150000 which is categorised under middle income but, because of family size and different farming activity cost they become fall under low earn society.

Members farming characteristics and agricultural activities

As shown in Table 7, concerning farming experience, (88.5%) of the respondents confirmed that five years and above experience. This shows that the majority of the agricultural cooperative's members have experience on agricultural activities. This finding contradicts with (Fulton M. and Giannakas K., 2007) Those experienced members play an important role in supporting small agricultural producers and marginalised groups such as young people and women. They empower their members economically and socially and create sustainable rural employment through business models that are resilient to economic and environmental shocks. Although, all of the members have their own land 340(100%). The majority of the respondents see the fertility status and soil character of the plot as medium, 68.5%.

Access to input supply and output marketing service with its members

Agricultural input-output supply service is one of the important areas of socio- economic activity where cooperatives can play worthwhile role. While providing such Agricultural inputs-output rural markets have some common features including underdeveloped markets, illiterate buyers, lack of communication

facilities, many languages and vast spread of the market, storage and transport problems, seasonality of demand which are applicable to agricultural input markets as well (Singh,2004).

Table 8 shows that all of the members were involved in purchasing agricultural input from the cooperative and sales their agricultural product to the agricultural cooperative 340 (100%). This finding contradicts with (Hussi et al, 1993), especially agricultural cooperatives, provide their members with the advantages of economies of scale by combining their resources, producers can obtain the needed goods and services more efficiently and market them in the larger volume, thus giving them a stronger bargaining position in dealing with traders and processors.

The type of input provided to farmers through cooperatives solely were soil fertiliser, chemicals, commodities and improved seeds in order of importance (47.9%, 28.5%, 0.9% and 22.6%) respectively. This finding supports with (Hussi et al, 1993) that cooperatives could serve their members by providing agricultural supplies and bargaining their produces to the market. The main types of agricultural inputs provided through cooperatives to member farmers were hence, soil fertiliser, chemicals and selected seeds.

The main advantages of buying items from cooperatives over private businesses were relatively cheaper price and correct measurement of items (Hussi et al, 1993). In contrast to this more than half, (74.4%) witnessed that they were not able to get all the agricultural inputs from their cooperative society on the right time and at the required quantity. So, it can be inferred farmers were not getting all the agricultural inputs from their cooperative society on the right time and at the required quantity though their need of agricultural input differs according to the type of crop they grow.

Out of sample cooperative members, their source of information about the market price of agricultural product were local market, cooperative promoter, retailers, extension workers/development agent, wholesalers and others with percent of (37.4%), (5.3%), (14.4%), (2.1%) and (0.3%) respectively. These shows that the majority of the respondents 37.4% get information about the market price of agricultural product is from local market. This finding supports with (Chiyoge B. 2013) local market facilitate small producers' access to: Information, knowledge and extension services about the market price of agricultural product.

The pricing strategy of agricultural products not only affects the product demand and purchasing behaviour of members, but also the income distribution of node enterprises and the overall profit of the agricultural supply chain. Concerning pricing strategy, (55.3%) of the respondents confirmed that the pricing strategy of the cooperatives in input/output marketing was reasonable. This finding supports with (Huo et al., 2022) reasonable product pricing can promote the fair distribution of income and adjust consumer demand for products and the market share of enterprises. For some agricultural product supply chains with farmer cooperatives as their core enter-prices, which are mainly engaged in characteristic agricultural products, it is of practical significance to rationally formulate their pricing strategies.

Members credit using pattern and cooperative credit services

As shown in Table 9, all of the cooperative's members were get borrow money from the agricultural cooperative to access agricultural input (100%). Their purpose of borrow money from agricultural cooperative is purchase of fertiliser, purchase of chemicals and purchase of farm implements, with the percent of (48.2%), (26.5%), (1.5%) and 81 (23.8%) respectively. Their reasons to borrow and purchase input in loan from the cooperative were less security is required (12.6%), easier to get loan (48.5%), cheapest source of credit that could be found (1.8%) and possibility of getting on time (37.1%). This implies that members of agricultural cooperatives are mostly prefer those agricultural cooperatives because of the possibility of getting loan. When the supply of agricultural input credit is enough to fulfil its demand, then farmers may be able to use the recommended rate of farm input. Therefore, farmers who acquire the amount demanded can able to produce enough products and then they can easily repay their debt on time compared to those who do not get the required amount of input. This finding supports with Bekele (2005),

revealed that increased input loan amount enables the borrowers to generate more income and this leads them to repay their debt in time.

Membership duration and condition

As shown in Table 10, a majority of the respondents have been members of the cooperative for six years (25.3%) followed by five years (19.1%). This implies that majority of respondents are more experienced about the cooperative condition. This represents the total number of years since the household head has become a member of that cooperative. Since member's active participation is an important cooperative principle, member who have joined the cooperative earlier may have strong attachment to the institution and may contribute to and democratically control the capital of the cooperative society. They receive limited compensation if any, on capital contributed as a condition of membership. So, it is fair to hypothesise that senior members have better sense of belongingness and show loyalty to their cooperative than the fresh ones. This finding supports with (Sholotan, et al.,2017) For the cooperative to be successful, its members, as user-owners of the cooperative must be active through their patronage, capital investment and participation in decision making. Cooperatives should also efficient to provide services to their members and their families. Moreover, they have also social responsibility to improve the quality of life in its community. Unlike a private enterprise, whose basis is its capital investment, the cooperative is based on its membership H/Selassie W. (2003).

On the other hand, member have awareness about the role of cooperative and they influence their neighbours and friends become the part of cooperative benefit. members of cooperative joined agricultural cooperatives in order to increase their productive live by get agricultural input supply and output marketing service.

Members perception on performance of agricultural cooperative on input/output marketing

As shown in Table 15, the performance of agricultural cooperative have positive and significant role on input-output marketing. This finding implies that member's evaluation of performance of agricultural cooperative positively influenced their overall perception of input/output marketing on Sinana, Agarfa, Gasera and Goro agricultural cooperatives. In other words, the performance of agricultural cooperatives plays a vital role on the perception of a members based on price stabilisation, disseminating marketing information, credit provision, solving members marketing problems demand oriented service provision and achieving objectives. Several previous studies reveals that performance of agricultural cooperative have found a linear relationship in input-output marketing. (for cooperative, 2004; Kebede, 2006; Sukhpal, 2002).

Perception of members on transparency and accountability and its role on input-output marketing

As revealed in Table 15, the perception of members on transparency and accountability have negative and significant role on input-output marketing. This finding implies that member's evaluation of cooperative transparency and accountability negatively influenced by their overall awareness of transparency and accountability on input/output marketing on Sinana, Agarfa, Gasera and Goro agricultural cooperatives. In other words, the transparency and accountability plays a vigorous role on the perception of a members on transparency and accountability based on cooperatives' board and management report to the general meeting, cooperatives' board and management decide based on the by-law, cooperatives' board and management aware on duties and rights, cooperatives' board and management dividend distribution procedure. (Alema, 2008; Jemal, 2008; Eshetu, et al., 2019).

Perception of members satisfaction on the service rendered role on input-output marketing

As revealed in Table 15, perception of members on satisfaction on the service rendered have positive and significant role on input-output marketing. This finding implies that member's evaluation of satisfaction on the service rendered by agricultural cooperatives positively influenced their overall insight of satisfaction on input/output marketing on selected woreda of agricultural cooperatives. In other words, members

satisfaction on the service rendered plays a vigorous role on agricultural input and output marketing accountability based on price differences, demand oriented, proximity to the village, timing of input supply, costs to use the services and quality of services. Several previous studies found a linear relationship between member's satisfaction and input/output marketing which determines input/output marketing. (Gebru, 2006; Dejene, 2016; Jemal, 2008).

Members participation in cooperative affairs role on input-output marketing

As revealed in Table 15, members' participation in cooperative affairs have positive and significant role on input-output marketing. This finding implies that members participation in cooperative affairs plays a vital role on like attending annual meeting, approving the by-law/amendment, electing different committee and board members, approving annual plan and budget of cooperative, approving audit report. determining share values, participating/sharing responsibilities, evaluating and approving executed activities report. Several previous studies members participation in cooperative affairs have found a linear relationship between members participation and input/output marketing which determines input/output marketing (Chukwu, 1990; Deselegn, 1994; Hailesilasie, 2003; Kebede, 2006).

Organisational internal factor's role on input-output marketing

As revealed in Table 15, organisational/internal factors have negative role on input-output marketing. This finding implies that member's evaluation of organisational/internal factors of cooperative negatively influenced overall input/output marketing on selected woreda of agricultural cooperatives. In other words, those organisational/internal factors are limited capacity of board and management, inadequate initial capital, poor participation of members in decision making, lack of transparency and accountability, failure to notify annual meetings, knowledge about duties and responsibilities, equal opportunity in passing decision and limitation to exercise their right (Tesfaye, 1995).

External factors' role on input-output marketing

As revealed in Table 15, external factors have negative role on input-output marketing. This finding implies that member's evaluation of External factors of cooperative positively influence overall input/output marketing on selected woreda of agricultural cooperatives. In other words, external problems effects on input/output marketing are small and fragmented farm holdings, high influence of vested interest, price increase for agricultural inputs, existence of other competitors, low price of produces and high cost of production. Several previous studies found external factors have a linear relationship with input/output marketing which determines input/output marketing (Alema, 2008; Gebru, 2006; Jemal2008; Julia 1999; Tesfaye, 1995).

Infrastructure factors' role on input-output marketing

As revealed in Table 15, infrastructure challenges have positive and significant role on input-output marketing. Infrastructure challenges affects and unimportant on input/output marketing, those challenges are, communication technology, marketing infrastructure, storage and transportation facility, access to irrigation facilities, linkages with financial institution. (Fassil, 1990; Jemal2008; Julia 1999; Tesfaye, 1995).

Interview analysis

The responses from the interviews indicated that the main objective of the agricultural cooperatives is to enhance the economic well-being of their members through collective action and shared resources.

Interviewees highlighted that the agricultural cooperatives have clear rules and regulations governing their operations, ensuring transparency, accountability and equitable decision-making processes.

The functions of the agricultural cooperatives include bulk purchasing of inputs, collective marketing of outputs, sharing knowledge and resources among members and advocating for the interests of farmers at the local and national levels.

The organisational structure typically consists of a board of directors, management team and various committees responsible for specific aspects such as finance, marketing and membership.

The management team is entrusted with the powers to make strategic decisions, implement policies and oversee day-to-day operations. They have a duty to act in the best interests of the members, be accountable for their actions and ensure transparency in financial and operational matters.

Interviews revealed data regarding the volume and types of inputs purchased and distributed by the agricultural cooperatives over the last five years, indicating the cooperative's commitment to providing members with necessary resources for farming activities.

Challenges faced included limited market access, price fluctuations, inadequate storage and transport facilities, competition from larger players and difficulties in accessing credit and technical support.

Recommendations to address these challenges included enhancing market linkages, improving storage and transport infrastructure, providing training on marketing strategies, facilitating access to credit, promoting value addition activities and strengthening collaboration with other stakeholders in the agricultural value chain.

Conclusion and Recommendations

Conclusion

Agricultural cooperatives are often seen as key institutional intervention in enhancing farmers' access to markets, as one form of institution that fulfil exchange and coordination functions in an economy (Barrett, 2008, Hellin et al., 2009). For maximisation of the agricultural input-output marketing, identifying and knowing the role of agricultural cooperative has a great role.

The study is with overall objective of investigating the role of agricultural cooperatives in agricultural input and output marketing in Bale zone. Consistent with the overall objective it is with specific objectives of:

- To describe the participation level of agricultural cooperative members in agricultural input-output marketing activities

- To examine the effect participation of agricultural cooperative members in agricultural input-output marketing activities

- To identify the effect perception of members in agricultural input-output marketing activities in Bale zone.

- To examine the major factors that hinders the performance of agricultural cooperatives in delivering agricultural input-output marketing activities.

In order to address the research objective, the study used a data collected from 340 out of 393 sampled agricultural cooperative members. Having the above-stated objectives in mind, the data from the questionnaires was analysed by using descriptive analysis (frequencies, mean, standard deviation and percentages) Descriptive analysis is used to describe the data and characteristics about the population or phenomenon being studied, in the form of table and frequency statistics and a structural equation model (SEM) and path analysis through a path diagram. The researcher used AMOS v23, which was installed on IBM SPSS Statistics (version 26), for diagnostic tests, model selection, path analysis results of the structural equation model and hypothesis testing. Path analysis (regression analysis) was identified as the most fitting tool for econometric analysis of the data. The path analysis with maximum likelihood estimation technique was chosen for this study because the data was purposefully chosen and an analytical test of all assumptions included the structural equation model between dependent and independent variables. Normality, measurement of sampling error and model fit indexes (goodness of fit index, absolute fit indexes, root mean square error approximation, normal fit indexes, comparative and incremental fit indexes) were validly tested.

Concerning on the income of members agricultural cooperative increase members' production and incomes by helping better link them with finance, agricultural inputs and information and output markets. It also helps farmers' benefits from economies of scale to lower their costs to acquiring inputs or hiring services such as enables farmers to improve product and service quality and reduce risks. Their annual income also indicates that good. On the other hand, the community economic is depended only in the farm activity like sales of cereals and pulses activities.

The cooperative's members also have experience on agricultural activities. Although, all of the members have their own land and they see the fertility status and soil character of the plot as medium.

Although farmers were engaged in purchasing agricultural input from their cooperative and sales their agricultural product to the agricultural cooperative. The main types of agricultural inputs provided through cooperatives to member farmers were soil fertiliser, chemicals, commodities and improved seeds. The main advantages of buying items from cooperatives over private businesses were relatively cheaper price and correct measurement of items (Hussi et al, 1993). In contrast to this more than half, cooperative members were not able to get all the agricultural inputs from their cooperative on the right time and at the required quantity. So, it can be inferred farmers were not getting all the agricultural inputs from their cooperative society on the right time and at the required quantity though their need of agricultural input differs according to the type of crop they grow. The pricing strategy of agricultural products not only affects the product demand and purchasing behaviour of members, but also the income distribution of node enterprises and the overall profit of the agricultural supply chain. Concerning pricing strategy, the members confirmed that the pricing strategy of the cooperatives in input and output marketing was reasonable and they get information about the market price of agricultural product from local market.

Most of the members of the cooperatives are beneficiaries of credit service. Their purpose of borrow money from agricultural cooperative is purchase of fertiliser, chemicals and farm implements. Their reasons to borrow and purchase input in loan from the cooperative were less security is required, easier to get loan, cheapest source of credit that could be found and possibility of getting on time.

The majority of respondents are more experienced about the cooperative condition. This represents the total number of years since the household head has become a member of that cooperative. Since member's active participation is an important cooperative principle, member who have joined the cooperative earlier may have strong attachment to the institution and may contribute to and democratically control the capital of the cooperative society.

The second specific objective of this study was to examine members participation in cooperative affairs have positive and significant role on input-output marketing. The study found that members participation in cooperatives affairs have positive and significant effect on agricultural input-output marketing.

The third specific objective of this study was to identify the members perception that positively and significantly determine agricultural input-output marketing. The study found that members perception on performance of agricultural cooperative and members perception of satisfaction on the service rendered through agricultural cooperatives have statistically significant effects and positive associations with agricultural input-output marketing. However, Perception of members on transparency and accountability of cooperatives have negative and significant effect on agricultural input-output marketing. It indicates that members perception on performance of agricultural cooperative and members perception of satisfaction on the service rendered through agricultural cooperatives were the most important variable which predicts agricultural input-output marketing.

The fourth specific objective of this study was to examine constraints that hinders the performance of agricultural cooperatives that positively and significantly determine agricultural input-output marketing. The study found that external factors have statistically significant effects and negative impact on agricultural input-output marketing. However, contrary to the researcher expectation, organisational/internal factors and infrastructure factors have positive association and significant effect on agricultural input-output

marketing. It indicates that external factors were the most important variable which predicts agricultural input-output marketing.

In general, the results obtained from the analysis allow the acceptance of the majority of the proposed hypotheses. As part of its managerial implications, this study offers invaluable inputs to various agricultural cooperatives as far as the essentials of agricultural cooperatives was concerns.

The interviews shed light on the pivotal role of agricultural cooperatives in facilitating input supply and output marketing for their members. To enhance their effectiveness, cooperatives should focus on streamlining operations, improving market access, enhancing member participation and fostering partnerships with key stakeholders. By addressing challenges and implementing the suggested improvements, agricultural cooperatives can further empower farmers, boost agricultural productivity and contribute to sustainable rural development.

Recommendations

Based on the findings, the conclusions drawn, the following recommendations are suggested:

- Agricultural cooperatives should provide all the agricultural inputs (soil fertiliser, chemicals, commodities and improved seeds) for their cooperative society on the right time and at the required quantity.

- As indicated by the model members participation in cooperative affairs were crucial for agricultural input-output marketing it have positive effect on agricultural input-output marketing, especially attending annual meeting, approving the by-law/amendment, electing different committee and board members, approving annual plan and budget of cooperative and participating/sharing responsibilities. therefore, the government and agricultural cooperatives should be improving the participation of members to encourage agricultural input-output marketing by creating awareness about significant of agricultural cooperatives.

- Cooperatives should ensure timely and equitable dividend, provide quality of services, provide input on time and attract more suppliers and buyers.

- The federal as well as the regional Governments should invest on infrastructure such as marketing infrastructure, introducing appropriate communication technologies, roads, power supply, water supply etc. Particularly, the role of cooperatives in promoting quality and standardisation is vital and it is useful to the farmers to have access to high value market. Thus, familiarisation of cooperatives with the technology useful for quality and standardisation improvement and maintenance including their application is important to improve members' participation as well as input-output marketing.

- Continuous and intensive education/trainings should be given for the cooperative leaders at all levels and the capacity of employees requires the attention of government officials and other concerned bodies.

- Government and stakeholders should educate local communities about the role and benefits of cooperatives in farming activities.

- The cooperative should focus on fostering collaboration, promoting education and improving access to resources to enhance the livelihoods of its members.

- Agricultural cooperatives should prioritise building strategic partnerships with input suppliers, output buyers, financial institutions, governmental bodies and other relevant partners, the cooperative can enhance its operational efficiency, expand market access and gain access to crucial resources and expertise.

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RESEARCH ARTICLE

Inclusive classrooms in the digital age: A survey-based empirical study of technology-driven teaching in higher education

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Abstract: The rapid digital transformation of higher education has intensified discussions on inclusivity and equity in technology-enabled classrooms. This survey-based empirical study examines the influence of technology-driven teaching methodologies on student engagement and inclusive practices in a higher education institution. A quantitative descriptive and inferential research design was adopted. Data were collected from 100 students and 50 faculty members using structured multi-item Likert-scale questionnaires. Reliability was tested using Cronbach's alpha and hypotheses were examined using the Wilcoxon Signed-Rank Test. The results revealed statistically significant positive perceptions among students (Median=4.00, $p<0.0001$) regarding engagement through digital tools. Teachers also demonstrated significantly positive attitudes toward inclusive digital teaching practices (Median=4.00, $p<0.0001$). Cronbach's alpha values indicated strong internal consistency ($\alpha=0.84$ for students; $\alpha=0.81$ for teachers). The findings provide robust empirical evidence that technology enhances engagement and inclusivity when supported by teacher competence and institutional infrastructure.

Keywords: *Inclusive education, Technology-enhanced learning, Higher education, Student engagement, Digital inclusion*

Introduction

The integration of digital technologies into higher education has transformed instructional methodologies and classroom engagement practices. Learning Management Systems, virtual classrooms, collaborative platforms and adaptive learning tools have enabled educators to personalise instruction and respond to diverse learner needs. However, the success of digital transformation depends on equitable access, teacher competence and institutional support. This study investigates stakeholder perceptions of technology-driven teaching in promoting inclusive classrooms.

The discourse on inclusive education has evolved significantly with the integration of digital technologies in higher education. Scholars increasingly argue that technology, when strategically implemented, can serve as a catalyst for equity, accessibility and learner engagement. However, the literature also highlights that digital transformation is not inherently inclusive; rather, it requires systemic alignment between pedagogy, institutional policy and technological infrastructure. Smith (2018) contends that technology integration enhances differentiated instruction by allowing multiple means of content representation and assessment. Digital platforms enable instructors to tailor instructional materials according to varied learning styles, thereby fostering inclusivity. However, Smith warns that technology adoption without structured professional development often results in surface-level usage that does not meaningfully improve learning equity. Furthermore, Johnson and Patel (2019) examined blended learning environments and concluded that hybrid instructional models increase participation among diverse student groups. The flexibility of

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accessing lectures asynchronously particularly benefits learners who require extended processing time or who face physical or geographical constraints. Their findings reinforce the argument that accessibility and flexibility are central pillars of inclusive digital education.

Lee (2020) investigated digital pedagogy and its relationship to engagement, finding that interactive tools such as polls, discussion boards and multimedia resources increase student participation rates. Engagement was conceptualised not merely as attendance but as active cognitive involvement. The study suggests that engagement is a mediating factor linking digital innovation to inclusive outcomes. Besides, Nguyen (2020) focused on teacher readiness and digital competence, identifying technological self-efficacy as a significant predictor of inclusive implementation. Educators who demonstrate confidence in digital tools are more likely to adopt adaptive technologies and collaborative methods that accommodate learner diversity. This highlights the centrality of teacher agility in sustaining inclusive transformation. Ahmed and Thomas (2021) emphasised the role of assistive technologies in bridging accessibility gaps. Tools such as screen readers, captioning systems and adaptive assessment software enable participation among students with disabilities. However, the authors caution that assistive technologies require institutional investment and ongoing technical support to remain effective. In addition, Kumar (2022) explored digital transformation policies in higher education institutions and found that administrative leadership significantly influences the sustainability of inclusive initiatives. Institutions that embed digital equity into strategic planning demonstrate stronger inclusive outcomes. This underscores the importance of systemic commitment rather than isolated technological adoption. Wang (2022) introduced the concept of the digital divide within higher education, arguing that socioeconomic disparities continue to undermine equitable access. Students from marginalised backgrounds often lack reliable internet connectivity and digital devices, limiting their ability to benefit from technology-driven instruction. The study calls for equity-centred policy frameworks to address structural inequalities. Fernandez (2023), through a systematic review of 40 empirical studies, concluded that technology enhances inclusion when aligned with universal design principles, teacher training and institutional backing. The review emphasises that digital tools must be intentionally designed to remove barriers rather than inadvertently create them. Hattie (2009), through extensive meta-analytic evidence, demonstrated that learner agency significantly impacts academic achievement. Technology contributes positively to inclusion when it increases student autonomy, provides feedback mechanisms and supports self-paced learning. This theoretical perspective supports the argument that engagement and autonomy are critical to inclusive digital classrooms.

Despite substantial global scholarship, there remains limited empirical research within the Indian higher education context that simultaneously examines student and teacher perceptions of technology-driven inclusivity. Many studies isolate either learner engagement or teacher readiness without integrating stakeholder perspectives. Additionally, empirical validation using inferential statistical methods remains underrepresented in regional contexts. Therefore, the present study addresses this gap by empirically examining the dual perspectives of students and faculty through structured survey analysis.

The literature collectively identifies three dominant determinants of inclusive digital education: engagement through interactive tools, teacher competence and institutional resource support. These constructs form the conceptual foundation of the present study and directly inform the formulation of research hypotheses.

Research Methodology

A quantitative descriptive and inferential research design was adopted. Convenience sampling was employed due to institutional access constraints. The sample included 100 students and 50 teachers. Two structured multi-item Likert-scale questionnaires were administered. Reliability analysis produced Cronbach's alpha values of 0.84 (students) and 0.81 (teachers). Hypotheses were tested using the Wilcoxon Signed-Rank Test with a test value of 3.

Research Hypotheses

H1 (Students): There is a significant relationship between the use of technology in teaching and the level of student engagement in an inclusive classroom.

H2 (Teachers): There is a significant impact of teacher digital competence and institutional support on the implementation of inclusive digital teaching practices.

Research Methodology and Source of Data

The study was conceptually grounded in a Sequential Explanatory Mixed-Methods framework; however, the present manuscript reports only the quantitative phase. A descriptive–inferential research design was adopted to both map prevailing perceptions of technology-driven inclusive teaching and statistically test the proposed directional hypotheses.

Primary data were collected through two structured, multi-item questionnaires administered separately to students and faculty within a higher education institution. A non-probability convenience sampling technique was employed due to institutional access limitations. Although probability sampling was not feasible, methodological rigor was enhanced through inclusion of dual stakeholder groups and an adequate sample size (N=150), thereby improving representational balance and analytical robustness.

The final sample comprised 100 students and 50 teachers. Student responses were used to test Hypothesis 1 (technology-driven teaching and student engagement), while teacher responses informed Hypothesis 2 (digital competence, institutional support and inclusive practice).

All items were measured on a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). The instruments were designed to capture perceptions of engagement, accessibility, digital competence and inclusivity. Internal consistency was assessed using Cronbach's alpha prior to inferential analysis to ensure scale reliability.

Given the ordinal nature of Likert-scale data and the directional nature of the hypotheses, the Wilcoxon Signed-Rank Test was employed to examine whether median perception scores were significantly greater than the neutral benchmark (test value=3). A one-tailed test was applied, with statistical significance set at $\alpha=0.05$. Data were collected anonymously to minimise response bias and enhance authenticity.

Pedagogical Agility and Resource Dependency

The two crucial mediating elements mentioned in the abstract for successful implementation are the main topic of this section.

Agility of teachers

The capacity of teachers to modify their teaching methods swiftly and effectively in order to incorporate digital resources, resolve technical issues and use technology to adapt to a variety of student learning demands is known as teacher agility. Technology's ability to provide customisation is closely correlated with the teacher's own readiness and self-assurance. The use of the newest technology is likely to be uniform if the instructor lacks agility. As a result, the technology's potential for adaptability is not fully leveraged and it becomes a barrier rather than a support for inclusive education.

Dependence on institutional resources

The abstract makes clear that institutional resources are essential to the effective application of technology. Hardware (devices, connectivity), human capital (IT support, technical support) and curriculum resources (access to licensed adaptive software, digital content repositories) can all be considered resources. However, at the institutional level, resources may be dispersed or simply insufficient, which exacerbates systemic inequities; in other words, it is turning supportive technology into a major obstacle to inclusive education practices for both educators and students.

Technology as a Hurdle versus Support

This analytical section explores the complex duality of digital integration, moving beyond simple advocacy.

Technology as a personalisation facilitator

Because technology allows for customisation, it improves inclusiveness. Differentiation at scale is made possible by adaptive learning software, which automatically modifies the content's pace and complexity based on each student's performance. In order to promote engagement while addressing accessibility through multi-modal options, digital tools offer a degree of autonomy that permits learners to participate in the way they prefer (e.g., auditory, visual, interactive) and express themselves in the way they prefer (e.g., video, digital presentation, writing).

Technology as an equity barrier

When technology creates new forms of exclusion, it becomes an obstacle to inclusive educational approaches. The digital divide, or unequal access to the internet and devices at home; digital literacy, or students' and teachers' lack of proficiency with the tools; and an excessive dependence on proprietary systems that prevent students from utilising assistive technologies that some students may need are some of the obstacles to inclusion. This investigation confirms how difficult it is to comprehend that inclusion involves more than just offering equipment.

Results and Discussion

This section presents the statistical findings of the study and interprets them in light of existing literature and theoretical constructs. The hypotheses were tested using the Wilcoxon Signed-Rank Test against the neutral benchmark value of 3.

Hypothesis 1: Student engagement

H1: Technology-driven teaching significantly enhances student engagement in inclusive classrooms.

The analysis revealed a median perception score of 4.00 (Agree), with a mean score of 4.13. The Wilcoxon Signed-Rank Test produced a test statistic (V) of 3278.00 with a p-value<0.0001.

Since the p-value is significantly less than the threshold value of 0.05, the null hypothesis is rejected. The findings indicate a statistically significant positive perception among students regarding the effectiveness of interactive digital tools in enhancing engagement.

Discussion

The strong positive perception suggests that tools such as quizzes, polls, videos and collaborative platforms meaningfully increase student participation and interest. This finding aligns with Lee (2020), who linked digital interactivity with enhanced engagement and Hattie (2009), who emphasised learner agency as a determinant of academic success.

The result also supports the argument that engagement functions as a mediating variable between digital innovation and inclusive learning outcomes. However, while perception levels are high, sustained engagement may depend on consistent pedagogical alignment rather than mere technological availability.

Hypothesis 2: Teacher Digital Competence and Inclusivity

H2: Teacher digital competence and institutional support significantly influence inclusive digital teaching practices.

The analysis showed a median score of 4.00 (Agree) and a mean score of 4.08. The Wilcoxon Signed-Rank Test yielded a statistic (V) of 1155.50 with a p-value<0.0001.

Since the p-value is below 0.05, the null hypothesis is rejected. The findings demonstrate a statistically significant positive attitude among teachers toward digital teaching as a facilitator of inclusive classroom environments.

Discussion

The positive teacher perception indicates strong pedagogical readiness and willingness to integrate digital tools for inclusion. This finding is consistent with Nguyen (2020), who identified digital competence as a key determinant of inclusive implementation. It also supports Kumar (2022), who emphasised institutional infrastructure as a foundational pillar for digital transformation.

However, the findings also imply that positive perception alone may not guarantee sustained inclusivity. Institutional resource stability and ongoing professional development are necessary to prevent technology from becoming an equity barrier.

Integrated findings

The combined results from both stakeholder groups indicate strong alignment in favour of technology-driven inclusive teaching. The convergence of student engagement (H1) and teacher readiness (H2) strengthens the empirical validity of the study.

This dual-stakeholder validation suggests that digital transformation within the institution is positively perceived at both implementation and reception levels. Such alignment enhances the credibility of the findings and indicates systemic acceptance of technology-enabled inclusion.

Implications

The results suggest three major implications:

- Interactive digital tools should be systematically embedded into curriculum design to sustain engagement.

- Continuous professional development programs should be institutionalised to strengthen teacher digital agility.

- Infrastructure investment should prioritise reliability and accessibility to prevent digital exclusion.

Limitations and future research

Despite statistically significant findings, certain limitations must be acknowledged. The use of convenience sampling limits generalisability beyond the studied institution. The data are perception-based and cross-sectional, restricting causal inference. Future research may incorporate probability sampling, longitudinal designs and objective performance measures to strengthen external validity.

Further studies may also explore:

- Correlation between engagement perception and academic achievement.

- Comparative analysis across institutions.

- Qualitative exploration of digital barriers and equity challenges.

Conclusion

This study empirically assessed the impact of technology-driven teaching on engagement and inclusive practices in higher education. The findings demonstrate statistically significant positive perceptions among both students and teachers ($p<0.0001$), confirming that interactive digital tools enhance engagement and support inclusive pedagogy when effectively implemented. The results indicate that successful digital inclusion depends not merely on technological availability, but on the alignment of student engagement, teacher digital competence and institutional support.

Although the study is limited by convenience sampling and perception-based measures, it contributes empirical evidence to the discourse on digital transformation and inclusion within the higher education context. Sustained inclusivity will require structured professional development, reliable infrastructure and equity-oriented institutional strategies. When strategically integrated, technology-driven teaching can function as a catalyst for meaningful and sustainable inclusive educational advancement.

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WISDOM
MANAGEMENT
JOURNAL

A bibliometric analysis of information technology and auditing publications

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Abstract: The recent demands of society as a result of modernisation have increased the need for information technology in auditing. This study seeks to evaluate the relationship between information technology and auditing while assessing the degree of information available for practitioners, students and researchers. Bibliometric and content analysis was used to review the auditing profession with regard to information technology. The study utilised data from the Scopus database for the period 1990 to 2023. A total of 637 documents were analysed. Citation analysis of documents and authors was applied in determining the impactful journals and influential authors in information technology within the auditing profession. The spontaneous increase in the number of publications over the years is evidence of the degree of research done on the subject. The analysis revealed that there is a positive relationship between auditing and information technology. The audit practice is seen to have involved meeting the demands of modern business by diversifying to cover different aspects of technological advancements being used in business. This resulted in the discovery of different audit and information technology forms that are linked to enable the achievement of objectives. The audit function has become a critical role required by stakeholders to ensure accountability for resources. Information technology has become an integral part of business processes aimed at ensuring efficient and effective operations. Consequently, I.T. is applied by auditors to evaluate technologically inclined businesses or enhance their operations.

Keywords: Information Technology, Auditing, Block chain, Bibliometric review

Introduction

The evolution of information technology coupled with the demands of modern society has increased the use of computers in the auditing profession. Computerisation plays a critical role in auditing by ensuring

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the integrity of information and reporting whiles safeguarding organisations against financial crises in the future (Senft and Gallegos 2014). According to the Indian Institute of Chartered accountants (2010), auditing under a Computerised Information System (CIS) environment requires auditors to be knowledgeable about the computer environment and abreast with current technology, even in the use of complex audit software. An efficient audit process requires practitioners to be knowledgeable in diverse fields (Daneci-Patrau and Spineanu-Georgescu, 2014; Ngungat and Lyimo, 2019). In the past, auditors used computers for making basic entries and calculations.

Incorporating technology in business has resulted in the development and adoption of several systems for the practice of auditing. Computer programs have been introduced to provide practitioners with varying packages that allow for completing tasks. Auditors use cloud computing for virtual information processing and analysis. Artificial intelligence is used to improve decision-making techniques (Sutton, Holt and Arnold, 2016) whiles blockchain technology is useful in analysing transactions (Dai & Vasarhelyi, 2017; O'Leary, 2017; Yermack, 2017). The Indian Institute of Chartered Accountants (2010) opines that, auditing under a computerised environment is characterised by speed, minimum clerical error, logical information processing platform, technological systems of internal controls and interacting computing systems for human use. Computers have become an integral aspect of organisational processes (Héroux & Fortin, 2013). Modern businesses rely on I.T. for their operations, this has increased the need for internal auditors with requisite expertise in information systems to be able to adequately evaluate risks that arise in business processes (Chen, Smit, Cao and Xia, 2014). Internal audit quality is thus, enhanced when information technology is incorporated into audit processes.

Organisational objectives are achieved when there are effective systems of internal controls in place. Internal auditing is designed to give management assurance on the efficacy of organisational governance processes. Auditors use information technology to retrieve online data, record manual data, analyse information, prepare working papers, evaluate audit criteria and report on findings. Accordingly, this research aims to analyse the Relationship between Information Technology and Auditing Publications about how information technology enhances auditing and whether audit publications are sufficient in Information Technology.

Technology has become an important tool in organisational processes by providing an avenue for effective operations. In this digital age, organisations require technology for smooth operations to ensure the effective and efficient use of resources (Mustapha and Lai, 2017). The integration of technology in business operations increases transaction processing and results in competitive advantage through the reduction of costs, human errors and inefficient processes (Abu-Musa, 2008). The auditor is challenged by increased calls for the incorporation of varying fields of expertise to achieve stakeholders' desired results (Ebimobowei, Kereotu and Brass Island, 2011). Stakeholders are of the view that confidence in the relevance of audits will be enhanced when there is a radical change in the practice of I.T. audits to reflect the demands of modern society (Appiah, Ametepe and Dapaah, 2014).

The existence of controls in a computerised environment is evident in the practices, policies and processes designed to guarantee the achievement of organisational objectives. The incorporation of audits with information technology results in advanced methods of risk detection compared to the traditional methods which use manual methods for audit procedures (Higgins and Nandram, 2009).

Notwithstanding, there is limited literature on the relationship between information technology and auditing publications about how information technology enhances auditing and whether audit publications on Information Technology are sufficient. This study thus will seek to fill the research gap by making a Bibliometric Analysis of Information Technology and Auditing Publications.

Methodology

The study utilised publications from Scopus with the information technology auditing, computerised auditing, audit, information technology, auditor, audit practice and, audit evidence'. The use of eight

keywords is to ensure wide coverage of literature. This method was adopted in ensuring that the term 'audit' was sufficient in representing the profession with the keywords - "audit" or "auditor" "auditing" or "auditors" "auditing profession" or "audit profession" (Mumin et al., 2020)

The study used the Booleans search technique within Scopus database to acquire documents covering the topic 'auditing AND information technology'. The population covered publications covering the period 1990 to date. This is a reliable scope in analysing the evolution of information technology and auditing and the impact of information technology on the auditing profession over the years. This is to ensure that all relevant data (publication) on the subject of study is included in the analysis. The period is considered suitable because it encompasses the period of globalisation of the World Wide Web which popularised the use of the internet in the early 1990s (Mugwira, 2022; Marson, 1997). The population considered generated 1,341 documents on the Scopus database.

To arrive at an appropriate sample for the study. The sampling criteria targeted the subject area, type of document, stage of publication, keywords and language. The sample used for the analysis was from 15 journal sources, written by 12 authors with at least 2 publications and linked to 83 institutions. This resulted in a sample size of 637 documents for the analysis. The sampled documents comprised 309 articles, 274 conference papers, 32 conference reviews and 22 reviews. According to Mumin et al (2020), including conference proceedings in the study will give the research a wide coverage of relevant studies on internet-related technologies in the audit profession.

Strategy

The findings will be analysed using bibliometrics. Bibliometric techniques are quantitative tools used to analyse literature reliably (Maditati et al., 2018). The study will use citation analysis, network analysis, bibliographical coupling and content analysis. Citation analysis will be used to show the performance of journals, articles, institutions and authors (Zupic & Ater, 2015). The study will review global and national publications every year. Bibliometric coupling is preferred because of its applicability in mapping current research fronts (Aria & Cuccurullo, 2017). The analysis will be carried out using VOSviewer and Excel.

Bibliometric Analysis

Annual publications

Table 1 below shows the yearly publication of documents on information technology and auditing on an annual basis. This is interpreted in the graph. The y-axis (horizontal side) is the number documents published per year. Series 1 represents the yearly publications and Series 2 is the cumulative number of publications available on the subject matter. The results show that studies on auditing and information technology began to rise steadily in 1998. It can be observed that the years 2020 and 2021 recorded the highest number of documents published on the subject matter. The year 2022 is the second highest (having 53 publications) even though the chart shows a decline in publications that year.

Table 1: Yearly research publications

Year	Publication	Cumulative Publications	Year	Publication	Cumulative Publications
1990	1	1	2003	7	42
1991	0	1	2004	19	61
1992	1	2	2005	22	83
1993	0	2	2006	12	95
1994	1	3	2007	18	113
1995	1	4	2008	30	143
1996	7	11	2009	25	168
1997	2	13	2010	31	199
1998	8	21	2011	33	232
1999	3	24	2012	22	254
2000	3	27	2013	31	285
2001	8	35	2014	18	303
2002	0	35	2015	26	329

Year	Publication	Cumulative Publications	Year	Publication	Cumulative Publications
2016	24	353	2020	61	520
2017	30	383	2021	61	581
2018	41	424	2022	53	634
2019	35	459	2023	3	637
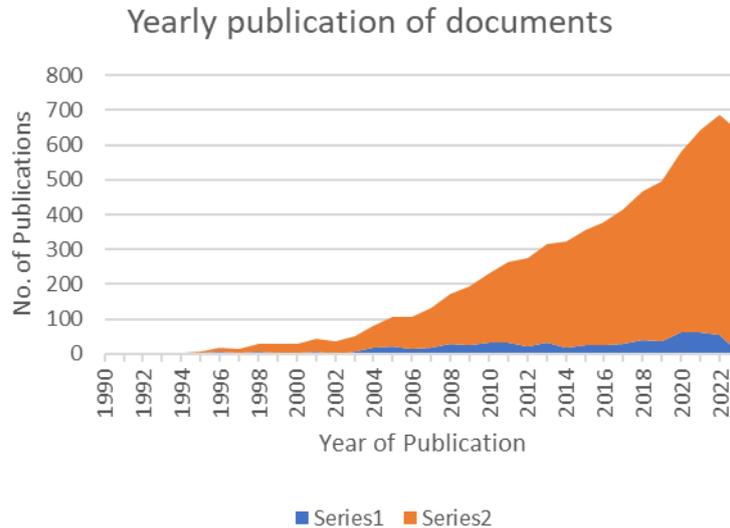
Figure 1: Annual publications

Country-specific production

Data was analysed to determine extent of research studies on the subject presented in Figure 2 and Table 2. The results were generated on a country basis. 83 countries were identified to have contributed a minimum of one (1) document on the subject. The total strength of co-authorship link with other countries was calculated and the country with the greatest link selected.

The pictorial visualisation shows that the United States dominated the research stream on the subject with increased studies spanning from 2012. The second dominant country shown is India with publications spanning from 2018 with a decline in 2018. Despite research on the subject in Africa dates back to 2012, the overall production is documents is low with no relationship with publications of other countries.
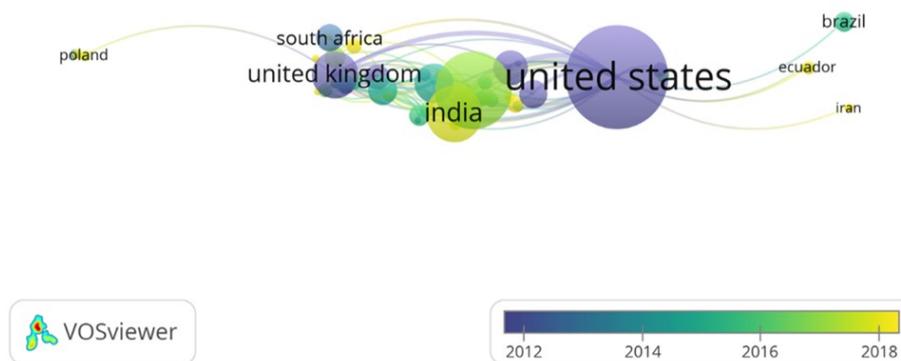

Figure 2: Country-specific production

Table 2: Countries with the largest set of items

Country	Publications	Citations	Percentage
United States	174	4054	27.230047
India	62	556	9.7026604
United Kingdom	46	1257	7.198748
Ecuador	5	6	0.7824726
Brazil	10	29	1.5649452
Iran	2	16	0.312989

Country	Publications	Citations	Percentage
South Africa	18	465	2.8169014
Poland	4	21	0.6259781

Citation analysis

Zuptc and Ater (2015) opined that citation analysis is used to deduce the performance of publications in relation to journals, articles, institutions and authors. This study used the analysis to determine the connection among documents, authors and sources. This is relevant in answering the first research question. Documents (279) with a minimum of 5 citations were considered for the analysis. 14 documents had the highest connection This result is displayed in Figure 3. As could be seen in Figure 3, the citation connections between them are shown as arrows. The size of each node reflects the number of citations that the publication has received from other publications within the dataset. The green cluster consisting of Bierstaker et al. (2001), Du and Cong (2010), Eulerich and Kalinichenko (2018), Alles et al. (2006), Groomer and Murthy (2004). These references primarily revolve around impact of information technology on accounting and auditing process. Furthermore, a significant portion of the literature delves into the functionality of information technology reducing manually of accounting and auditing and revolving challenges accompany this revolution, exploring the different dimensions and indicators that contribute to the overall effectiveness and reliability of audit processes.

Purple cluster consisting Bierstaker et al. (2001), Murthy and Groomer (2004), Janvrin (2001), Zhao et al. (2004) and Flowerday and von Solms (2005). These references concentrate on digitalisation impact on financial reporting and other key areas of financial accounting. The cluster represented by yellow nodes indicates the low number of references made to Eulerich (2014) in the area of continues auditing quality of information technology is key in achieving this objective.
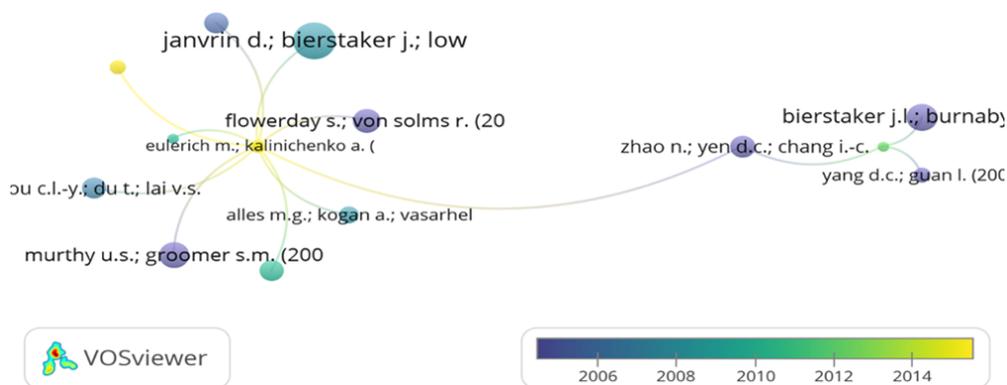

Figure 3: Citation analysis

Table 3: Citation analysis

Authors	Documents	Citations	Total Link Strength
Antipova T	3	20	0
Bukhsh F. A,; Weigand H	2	7	0
Elshiekh A. A.; Dominic P. D. D.	2	5	0
Flowerday S.; Von Solms R	2	63	0
Kotb A.; Roberts C.	2	28	0
Maciejewska I	2	1	0
Mkoba E.; Marnewick C	2	13	0
Pathak J.	2	35	0
Pedrosa I.; Costa C. J	2	15	0
Ren Y.; Shen J.; Wang J.; Fang I	2	6	0
Rosli K.; Yeow P.H.P.' Eu-gene S	2	20	0
Vroom C.; Von Solms R.	2	301	0

The citation analysis of authors with a minimum of two documents were analysed. Totally, 12 authors were identified to meet this threshold. The analysis revealed that there is no link among the authors. This result is displayed in Table 3 and Figure 4.
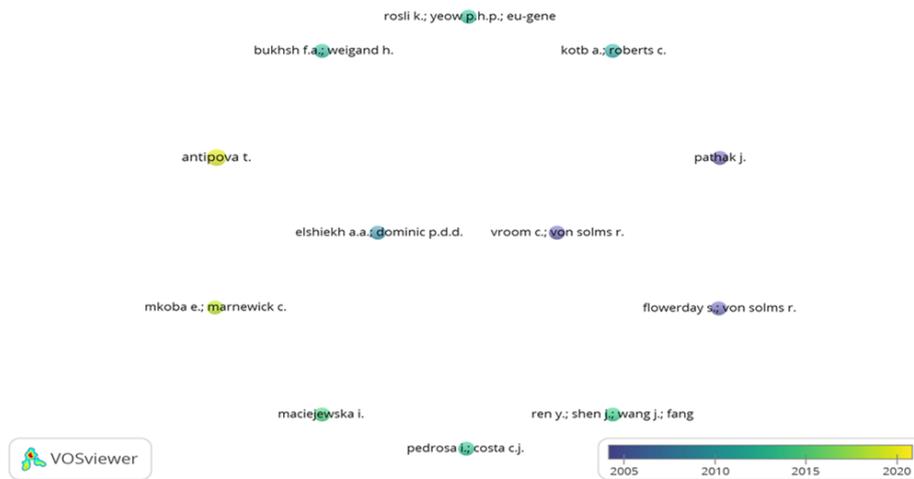
Figure 4: Author citation analysis zero (0) connection

The document and author citation analysis identified 12 influential authors in the subject matter. Citation analysis of document sources was conducted with keywords of five documents per journal or source. It was revealed that seven sources had the largest set of connected items. The sources identified to be the most influential per the subject matter are: Journal of Information Systems, International Journal of Accounting, ACM International Conference, Decision Support Systems and Computers and Security. The most influential publications in a research area is useful in identifying the most relevant articles with impactful ideologies as well as possibility of recommending future research areas (Alon et al., 2018). The most influential articles are assessed based on the article with the strongest link with other publications. The basis for determining the link is the total number of publications and citations. Therefore, the article with the strongest list has a high quantity of documents and a huge number of citations. In lieu of this, the journal of information systems is considered the most influential out of the five influential sources because it has a huge number of document citations and quantity of publications. This is shown pictorially in Figure 5 and in Table 4.
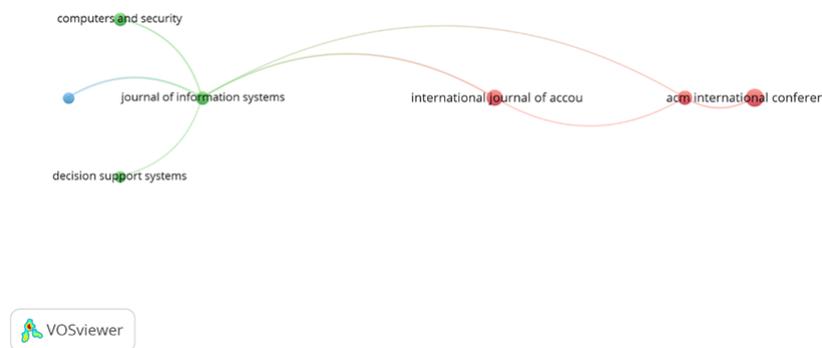

Figure 5: Source citation analysis

Table 4: Source citation analysis

Sources	Publications	Citations	Total link and strength
Journal of Information Systems	8	717	9
Computers and Security	8	439	2
Decision Support Systems	5	94	1
International Journal of Accounting	14	502	3
ACM International Conference	19	60	2

Bibliographic co-occurrence

Co-occurrence on words was used to determine evolution of keywords on auditing and information technology. This analysis is used to answer the second research question. The relationship between the

variables was analysed by running co-occurrence on author key words. The search method used is full counting. Documents with a minimum of 5 occurrence of the keywords was selected for the analysis. The bibliographic results as presented in Table 5 and Figure 6 show the association between auditing, information technology and other audit and IT related keywords such as big data, internal auditing, continuous auditing, accounting, block chain management, internal controls, data security, distributed ledger technology. The results show that studies on auditing, internal auditing, risk management and information technology were dominant in 2010. The periods 2012 to 2016 witnessed researches in auditing and cloud computing, continuous auditing and data securities. This result is similar to the results of Mugwira, (2022) which revealed that, the period 2010 to 2019 was characterised by astronomical rise in related key words on internet related technologies on auditing such as cloud computing, blockchain, big data, machine learning and data analytics.

Table 5: Co-occurrence of keywords

| Keywords	Occur-rences	Link Strength	Keywords	Occur-rences	Link Strength
Auditing	105	101	Information systems	14	19
Block chain	63	78	Internal Auditing	16	18
Cloud computing	41	51	Internal Audit	16	17
Accounting	24	46	Integrity	8	16
Information Technology	40	37	Internal control	9	12
Continuous auditing	24	28	Auditors	9	13
Audit	28	22	Cloud storage	13	12
Public auditing	16	22	Risk management	8	12
Artificial intelligence	11	21	Block chain technology	8	3
Big data	20	21	I. T. Audit	8	9
Data security	10	20	Communication technologies	6	6
Information security	20	20			
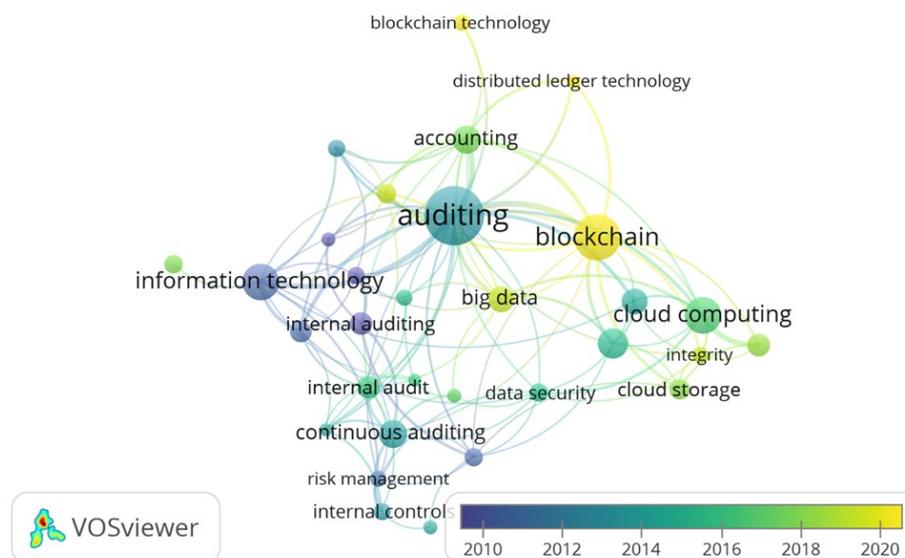
Figure 6: Co-occurrence of keywords

Bibliographical coupling

This approach was used to identify underlying research streams. This analysis is useful for forming a basis for answering the third research question. 639 documents were analysed with a minimum of 5 citations per document. 279 items met the search criteria, however, the analyses concluded that only 9 documents with a minimum of 3 clusters were linked seen in Figure 7. The research streams found in the literature include the effect of information technology on audits, the impact of big data on auditing, challenges associated with Cloud computing in the audit profession and factors that influence the use of artificial intelligence.

Figure 7: Document bibliographical coupling

Effect of Information Technology on auditing

In the past, auditors relied on financial statement information in assessing risk (Song et al, 2014). This caused standard setters to clearly define the responsibility of the auditor as evidence gathering aimed at providing reasonable assurance. The responsibility for the prevention of fraud is now charged to management. Information technology has helped auditors in making informed fraud evaluations on unorganised data (Dong et al., 2018). Client information technology resources are essential in bringing improvement to current and future audit efficiency (Pincus et al., 2017). According to Malaescu and Sutton 2015, external auditors' reliance on internal audits is increased when internal audit activities are I.T inclined.

Impact of big data on auditing

Big data is a series of interrelated data with a wide-reaching system characterised by storage difficulties, complicated analysis and interpretation. In the audit practice, big data can be used internally and externally. Practically, the degree of use of big data by clients determines the amount of big data to be used by auditors (Dagilien & Klovien, 2019; Lombardi et al., 2014). The audit opinion is therefore affected by big data discrepancies between auditors and clients. According to Earley (2015), an audit-client relationship is improved through big data auditing. The major inhibition to the adoption of big data in business and auditing despite its benefits is the lack of skills required to successfully implement big data to auditors and businesses. This situation is worsened by the high cost of training available for auditors. Dagilien and Klovien (2019) opined that audit firms' financial constraints are a major determinant in ascertaining the ability to implement big data auditing.

Challenges associated with cloud computing on the audit profession

Cloud computing is a system that offers virtual products such as storage and applications, among others. It offers auditors the opportunity to offer services to both service providers and users (Schmidt et al., 2016) as well as use the products (Hu et al., 2018). Cloud systems are practically essential to audit practice.

The main challenges faced by audit practitioners with regard to cloud technology are information confidentiality and data privacy towards public cloud services (Yigitbasioglu, 2015). Chou, 2015 established that data restriction as a result of client data privacy can make auditing cloud computing systems complicated.

Bibliometric Findings

The bibliometric findings show that there is a positive relationship between information technologies and auditing, in that, the auditing profession has evolved over the years to incorporate varying technological systems in the practice. This is consistent with the results of Thottoli, Thomas and Essia, (2019) in which it was concluded that a strong relationship exist between information communication technology and the software used in auditing. This makes the profession relevant to meet the demands of modern business.

Degree of information on IT auditing available for practitioners, students and researchers

There are several studies on information technology and auditing, dating back as far as 1990. The increasing level of research available reached its peak in 2021 and began to decline in 2022. The decline is due to the advancement of the profession into other aspects of technology such as block chain, cloud computing, data security among others. The United States of America dominated the research streams with 174 documents cited 4,054 times. This was followed by the United Kingdom, with a total of 46 documents, cited 1,257 times. South Africa was the highest linked African country with 18 documents sighted 465 times. This implies that African researchers have not done a lot of research on information technology and auditing. However, students and practitioners all over the world can conveniently have access to studies and information through the internet. The internet provides an avenue for practitioners to learn and businesses to explore the latest software and opportunities in the form of training available for them. Students and researchers can access the information they require to inform future research on auditing.

Impact of Information Technology on auditing

Information technology has revolutionised auditing by providing practitioners systems to help in the discharge of their duties. The study showed that audit is adopting to the different tenants of information technology introduced into the business environment. The analysis showed researchers assessing the practice of audit in diverse technological environments and businesses. Information technology has changed the methods through which auditors analyse and report transactions as well as the practical methods of implementing standards of practice.

Challenges associated with Information Technology auditing

The study revealed that the main challenges associated with implementing information technology audit practices are cost and training. The cost of implementing a computerised system is seen to be high for most local audit firms and small to medium organisations. The decision to use a computerised system or software depends largely on the nature of the clients' business or operating methods of the firm being audited and the auditing firm's acceptable procedures for service delivery. The ability of an auditor to use information technology in his work or work in a technologically inclined organisation will influence the use of information technology. The other challenges identified include security and privacy threats.

Discussion

Information technology plays a vital role in the achievement of organisational objectives by providing systems that make operations effective. In applying the agency theory to this study, the responsibility of management and auditors in the achievement of organisational objectives is assessed. The responsibility of management to detect and prevent fraud implies implementing computerised systems that will ensure effective and efficient suggestions without exposing the organisation to risks. Management of a technologically inclined business should put in place controls to prevent unauthorised access, data security, among others.

The use of information technology in audit processes is more efficient in an environment where management has implemented technology in its operations and implements a system of internal controls to ensure efficient implementation. With regards to the policeman theory, the study evaluates the level of knowledge on the responsibility of the auditor available to the public to help bridge the expectation gap in the profession. The theory suggests that, whether the auditor is applying traditional/manual practices or computerised practices, the auditor is responsible for the detection and prevention of fraud. Auditors however apply professional judgement in discharging duties. The study found that several attempts have been made and still being made by researchers in support of standard setters to provide information on the role of information technology in the work of the auditor. This will help close the 'expectations gap' and enhance public confidence in auditors.

Some studies have also attempted to delve into new aspects of information technology by linking the audit practice to businesses operating in computerised environments and auditors appointed to work in such environments.

According to Solvito (2016), despite the level of efficiency associated with technologically controlled environments, over dependence on them raise concerns of system failure risks. The study found that, lack of expertise to implement technological audit procedures can hamper an auditor's ability to effectively assess computer systems to give an opinion. Auditing involves the application of professional judgement in deciding the procedures to apply on an audit. Auditors rely on their skills, experience and professional code of ethics in making professional judgement. I.T skills in auditing should be applied in audit assignments to produce reliable audit findings and reports.

Conclusion

This study has offered the current state of research concerning the influence of information technology on auditing. It was revealed that the effect of digital technologies on auditing have changed a lot overtime, with a lot more research happening in business, economics, computer science and information systems. Technology assisted audit practices have grown over the years with little studies done in Africa and most carried out in the USA. The assessment of journal publications revealed that, the five leading journal publications in the field are the Journal of Information Systems, International Journal of Accounting, ACM International Conference, Computers and Security and Decision Support System. The increasing level of research available reached its peak in 2021 and began to decline in 2022. The decline is due to the advancement of the profession into other aspects of technology such as block chain, cloud computing, data security among others. The United States of America dominated the research streams. This was followed by the United Kingdom with limited research from Africa. This implies that African researchers have not done a lot of research on information technology and auditing.

The study contributes to auditing literature by providing a review of the auditing profession with regards to the information technology demands of modern society. The dominance in research by the USA calls for studies from other countries and continents around the world. Collaboration among researchers and institutions should be encouraged so as knowledge sharing.

Notwithstanding the above, the limitation to this study relates to the use of data extracted solely from the Scopus database. Other social sciences journals that have in-depth publications on the topic are not catalogued within the Scopus database. Hence, these published articles were not included in this study. It is thus recommended that future research endeavours encompass the inclusion of documents emanating from both the Scopus and web of science databases.

Funding

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