

## RESEARCH

# Operations management of cooperatives' information and communications technology in Nueva Vizcaya

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This study evaluated the impact of information and communications technology (ICT) on the operations management of cooperatives in Nueva Vizcaya. By evaluating the respondents' profiles and cooperatives' profiles, and their relationship to ICT infrastructure and ICT access, the researcher would recommend ICT strategies to improve the operations of the cooperatives. The concept of the study was drawn from the modernization theory, and ICT access in terms of skills, literacy, and attitude toward technology. This study used a descriptive design to determine the respondents' profiles and the cooperatives' profile. In addition, the descriptive design was also used to determine the level of ICT access of the cooperative personnel and the extent of ICT infrastructure of the cooperatives. Moreover, this study used the correlational research design to determine the significant relationship between the profile of the personnel and the level of ICT access, the profile of the cooperative, and the extent of ICT infrastructure of the cooperatives. To assess the relationships between variables, two correlation coefficients were employed: Pearson's correlation coefficient and Spearman's rank correlation coefficient. The study revealed that cooperatives had a "moderate" extent of utilization of ICT infrastructure. Utilization was higher in systems configuration and Internet connectivity compared to organization and management and information technology strategy, while cooperative personnel had the necessary technology skills and literacy to effectively utilize ICT tools and applications in their work. Also, cooperative personnel demonstrated a great extent of positive attitudes toward ICT utilization.

**Keywords:** information and communications technology, operations management, cooperatives, ICT access, technology skills and literacy, attitude in technology

## 1 Introduction

The importance of information technology (IT) cannot only be seen in organizations but also in its individual members. To improve processes and operations, an organization may invest in technology. One area of technological advancement is in IT. Many businesses ensure that their operations run smoothly with the use of computers and allied applications (1). An integration of IT that focuses on communication technologies that include the Internet, wireless networks, cellphones, and other communication media is information communication technology (ICT).

With ICT, the communication capabilities of society have increased (2).

The advancement in ICT (3) has paved the way for web applications, telecommunications, and mobile devices. It has affected lives by improving the distribution of information in a short period (4). ICT provides many benefits across a wide range of business processes and transactions. ICT applications improve management of information and knowledge, decrease transaction costs, and increase the efficiency of transactions for both business-to-business and business-to-consumer transactions. Also, they are effective ways to upgrade outside communications and improving the quality of services (5).

In this regard, with the accessibility of the Internet, applications, infrastructures, and devices, the world is more than ready to accept a new era where we utilize more paperless transactions and the need to be physically present to close deals and perfect transactions is eliminated. To retain a place in the market, companies must compete successfully with other economic sectors and other entities within their industry. In line with these companies, cooperatives cannot be left behind and need to constantly update to adapt to these changes (6).

Researchers could assess the existing ICT competencies among cooperative members, identify the gaps, and propose strategies for capacity-building initiatives. Additionally, exploring innovative approaches such as e-learning and digital skills programs tailored to the cooperative context would be valuable (7).

Hence, this research aimed to evaluate the operations management of ICT of cooperatives in the urban municipalities of Nueva Vizcaya and to determine the level of their ICT access.

## 1.1 Objectives of the study

Generally, the study evaluated the ICT on the operations management of cooperatives in urban municipalities of Nueva Vizcaya.

Specifically, it aimed to:

1. Determine the sociodemographic profile of the cooperative personnel in terms of
  - 1.1 Sex,
  - 1.2 Age,
  - 1.3 Educational attainment,
  - 1.4 Current position,
  - 1.5 Number of years employed, and
  - 1.6 Number of trainings related to ICT;
2. Identify the profile of cooperatives in terms of
  - 2.1 Type of cooperative,
  - 2.2 Services or products offered,
  - 2.3 Category of the business in terms of total assets,
  - 2.4 Number of members, and
  - 2.5 Number of years in operation;
3. Determine the ICT infrastructure used by the cooperatives in terms of
  - 3.1 Organization and management,
  - 3.2 Information technology strategy,
  - 3.3 Systems configuration,
  - 3.4 Application environment,
  - 3.5 Internet connectivity/electronic data interchange,
  - 3.6 Disaster recovery and business continuity planning,
  - 3.7 System development and change control methodologies, and
  - 3.8 Computer operations;
4. Determine the level of ICT access of cooperative personnel in terms of
  - 4.1 Skills and literacy, and
  - 4.2 Attitude;
5. Identify the issues and problems encountered with regard to ICT;
6. Determine the significant relationship between personnel profile and the level of ICT access of cooperative personnel;
7. Determine if there is a significant relationship between the cooperative's profile and the ICT infrastructure of the cooperatives; and
8. Recommend ICT strategies to improve the operations of the cooperative.

## 1.2 Conceptual paradigm

The conceptual framework presented the independent and dependent variables that were used in the study, as shown in [Figure 1](#).

The framework that was used in the study consisted of two defined variables: the independent and dependent variables. The personnel's profile, such as sex, age, educational attainment, current position, number of years employed, and number of training related to ICT, and the cooperatives' profile, such as type of cooperative, services or products offered, category of the business in terms of assets, number of members, and number of years in service, are the independent variables. On the other hand, the ICT infrastructure is the dependent variable as well as the ICT access of the personnel such as skills and literacy, and the attitude of the personnel toward technology.

The personnel's profile may have an effect on the ICT access of the personnel such as skills, literacy, and attitude of the personnel toward technology. This may vary depending on their sex, age, educational attainment, current position, number of years employed, and number of training related to ICT. Likewise, the cooperatives' profile may have an effect on the ICT infrastructure. This may vary depending on the type of cooperative, services or products offered, category of the business in terms of assets, number of members, and number of years in service.

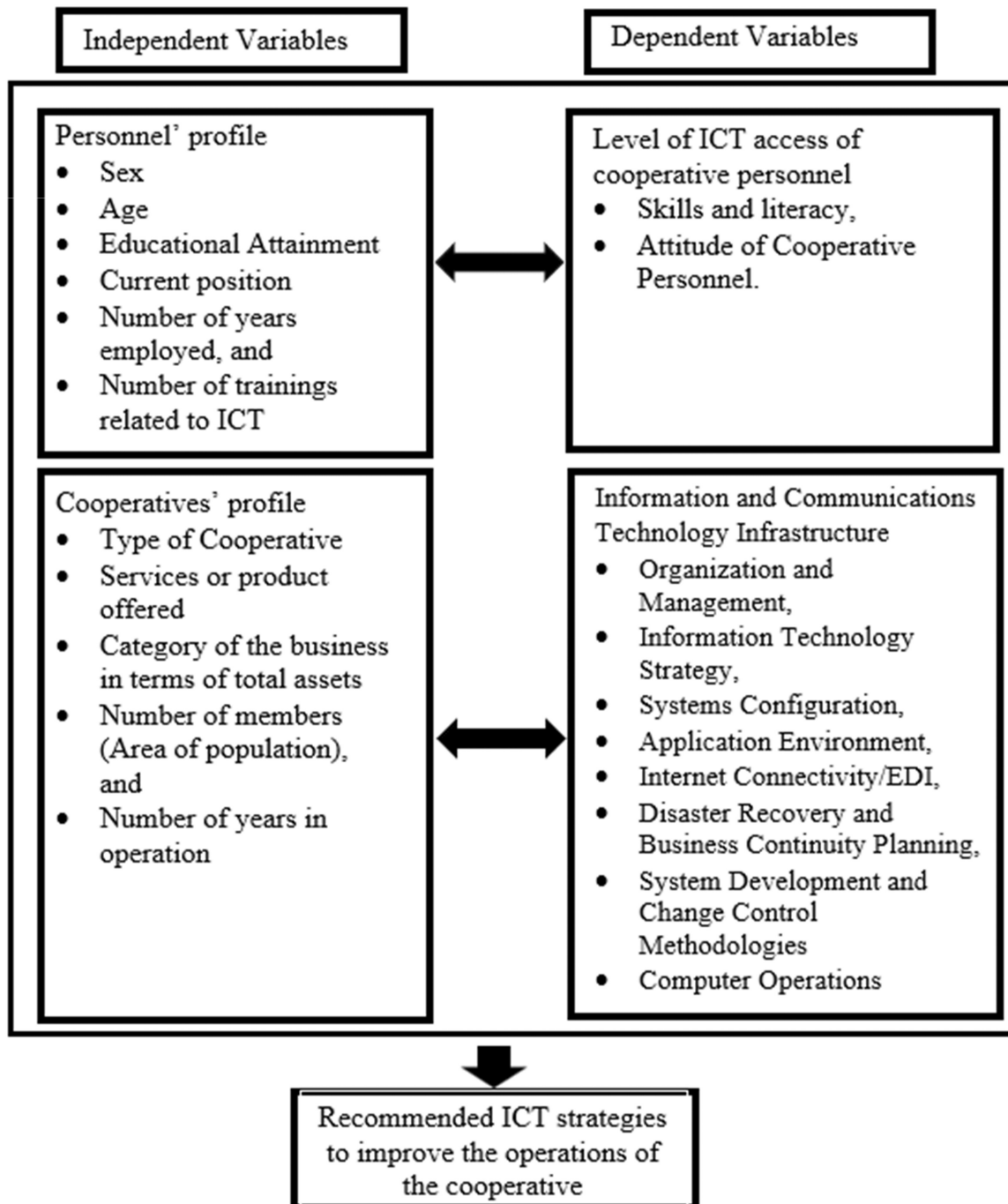


FIGURE 1 | Conceptual paradigm of the study.

Lastly, the dependent and independent variables led the researcher to improve the ICT strategies of cooperative.

### 1.3 Significance of the study

The result of the study would have significance to the stakeholders such as:

**Cooperative Development Authority (CDA):** Results of the study would benefit the government agency to assist the cooperatives in offering technology facilities and

developing programs and applications to improve the ICT of the cooperatives.

**Cooperatives:** Results of the study would help the cooperatives to level up their ICT in terms of technology access, technology skills, and personnel attitude to further result in business management and increase cash inflow.

**Cooperative Personnel:** Results of the study would help cooperative personnel improve their level of technology preparedness in terms of access, skills, literacy, and attitude.

**Cooperative Members:** Results of the study would help cooperative members improve their service and business experience with the cooperative.

**Software Developers:** Results of the study would create a new opportunity to develop applications and programs that are user-friendly for the cooperative personnel and members and can be customized according to the needs and capacity of the cooperative.

**Future Researchers:** Results of the study may serve as a benchmark in conducting a wider scope of research for the ICT management of cooperatives and their members.

## 1.4 Literature review

This section elaborates on the supporting theories and concepts of the study such as providing a brief background on the ICT infrastructure that is available and being utilized by cooperatives. It also includes insights on the role of ICT in cooperative operations management. Moreover, it includes a section on the Cooperatives in the Philippines, explaining the different types, services, or products offered as registered in CDA. The last part discusses the importance of ICT access for cooperative personnel in terms of skills, literacy, and attitude.

### 1.4.1 Management and ICT

The use of ICTs and their applications has started since the 1990s. Data and communication technology systems embody computers, laptops, and tablets, fastened and mobile phone systems, communication network software—even wearables. A business will use an ICT system to take advantage of improvements like reducing cost, increasing potency, and increasing its aggressiveness in the marketplace. IT has become vital within the business world. Even in small businesses, it helped the organization, manager, and employees take a lot of economic decisions, inquire about a number of explicit downsides, conceive its quality, and generate new products and services, thereby raising their productivity and output. Technology additionally gave the U.S. larger potency for conducting business (8).

In addition, some of the areas during which technology is crucial to business embody the purpose of sales systems, the utilization of ICT in management, accounting systems, and different complicated aspects of everyday business activities. Even one thing as straightforward as a result of the calculator, which was revolutionary in its time, happened thanks to technology. It is robust to imagine going back to performing arts tasks manually. It might take the U.S. back about a 100 years. Data technology is the utilization of computers and code to manage data. It refers to something related to computing technology, like networking, hardware, software, the web, or the oldsters involved with these technologies. These days several corporations have IT departments for managing the computers, networks, and different technical

components of their businesses, like storing data, protecting data, processing the knowledge, transmitting the knowledge as necessary, and later retrieving data as necessary. This is often stated as management data services (or MIS) or data services (or IS) (8).

### 1.4.2 Information and communications technology

Also, the use of ICTs and their applications has started since the 1990s. However, in recent years, ICT applications such as electronic commerce (e-commerce) and enterprise resource planning (ERP) have become indispensable for businesses to survive and thrive. The increased competition forced firms to find sources of competitive advantages and strengthen their competitiveness (5).

Moreover, the extreme competition has led many business firms to search for new, more powerful tools. Many firms have chosen to use ICTs as outstanding strategies to overcome the competitive environment and achieve a successful business (5).

For small firms to adopt e-business and e-commerce strategies and tools, benefits must outweigh investment and maintenance costs. Commercial considerations and potential returns drive adoption. Beyond a certain level of connectivity (PC, Internet access, online information, or marketing), not all Small and medium enterprises (SMEs) will necessarily “catch up” with large firms, simply because e-commerce may not bring large benefits, and SMEs will stay with traditional business processes. Other barriers have been seen to be the availability of ICT competencies within the firm, and the availability and cost of appropriate interoperable small-firm systems, network infrastructure, and Internet-related support services. Lack of reliable trust and redress systems and cross-country legal and regulatory differences also impede cross-border transactions (9).

### 1.4.3 Cooperative and ICT

The world of business has changed dramatically since the introduction of the first modern multipurpose computer over 50 years ago. When one thinks of a computer, one generally pictures computer hardware: the monitor, the keyboard, and the electronic circuitry contained within the rectangular case. There is more to a computer than this, however. The missing element is software—the instructions that tell the computer how to operate the hardware. All computers must have these two components to function. However, it is software that gives the computer one of its most distinguishing characteristics—the ability to program a single machine to perform many different functions (10).

When talking about a computer or a “PC,” one is usually referring to a desktop computer found in a home or office. Today, however, the lines of what makes a computer are blurring. Hardware is the physical structure that houses a computer’s processor, memory, storage, communication ports, and peripheral devices. Each of these components (called devices) has a different purpose, which may be

either accepting inputs, storing data, or sending outputs. For example, a mouse and a microphone are input devices used to record user activities and transform them into data that is transmitted to the system unit. A hard disk is a storage unit where data is stored and accessed by other devices. All parts of a computer that are not strictly physical, such as data, programs, applications, protocols, and the like, are broadly defined as “software.” Although software has no material form, it is no less critical to receive information, encode, store, and process it (10).

Cooperative members’ access to and use of technologies should be improved in order to increase their efficiency. Ultimately, they can help in achieving poverty reduction and fulfill social development goals. Cooperatives can function more efficiently by using ICTs and providing a series of benefits to members, such as enhanced connections between members and improved accounting and administration. Through cooperatives, farmers share market information and technical know-how, and they remain informed about the cooperative’s activities. Also, farmer cooperatives are often responsible for handling very large amounts of money that may represent the cash income of thousands of farm families. Efficient record keeping allows a cooperative to serve its members better, and the transparency offered by computerization and other technologies enhances trust. Cooperatives that have invested in modern management and member information systems can improve their image to attract high-quality staff and gain members’ trust and confidence (11).

In order to facilitate or provide access to ICTs to cooperatives, they must be strengthened by the establishment of an enabling environment, including a legal policy, business environment, and participatory frameworks that are conducive to the establishment and development of organizations. A greater number of cooperative members should benefit from training in the use and application of ICTs, in particular women and youth. Young people learn quickly and can then teach others. ICTs can equally make the agricultural sector more attractive to young people. Participatory needs assessments should also be carried out in view of better understanding what ICT is most appropriate, like a mobile phone versus a computer, in different contexts (11).

Like any other business organization, cooperatives need business plans and strategies to sustain their operations. While many people believe that formulating an innovative and unique strategy is critical and, by itself, enough to lead an organization to success, ensuring that such strategy works is equally important. Management must oversee the implementation of strategies to avoid common managerial mistakes. Several approaches that greatly enhance the effectiveness of strategy implementation can be employed. In connection, good strategic management is a function of people actively considering strategy as they make day-to-day decisions (12).

According to Benkari in 2017, with the changing business trends, many business organizations lose their market advantages by failing to adopt the available advancements, specifically in the technological area. Research outputs have related business demise from the failure to improve their process in line with the available technologies that positively affect productivity.

Hence, the advancements in technology have brought many changes in how business is being done. Many have benefited from increased productivity and a positive impact on organizational growth. These were before a global pandemic hit the world and froze many business transactions and product movement. The COVID-19 pandemic has accelerated a move to working online for many sectors of society (13).

Given this urgency, it would be risky to ignore the increasing interest of multinational corporations in investing billions in established and start-up businesses providing online education during the pandemic. Digital technology has been at the center of the COVID-19 pandemic both globally and in the United Kingdom, in particular. Not only have the lives of millions of people migrated online at a stroke as part of enforced lockdowns, but digital innovation has also been integral to the public health response, reflecting a well-established pattern, which assumes that digital technologies and big data mitigate the harms caused by disasters (14).

In the Philippines, an independent government agency known as the Cooperative Development Authority (CDA) was created on March 10, 1990, through the passage of Republic Act No. 6939, or the CDA Charter, to provide general supervision and control over all cooperatives in the country. The CDA is a proactive and responsive lead government agency for the promotion of sustained growth and full development of the Philippines cooperatives for them to become broad-based instruments of social justice, equity, and balanced national progress.

Organizational Capacities of Selected Cooperatives in the Upland Areas of Nueva Vizcaya, Philippines, revealed that the chosen cooperatives had a wide range of membership, financial capacity, governance experience, and experience launching and running agricultural businesses (15).

According to the CDA (16), the majority of the cooperatives did not encounter a reduction of employees, a decline in productivity through work from home, a decrease in production, and business closure. Rather, the reduction of working hours and a decline in marketing transactions of cooperative products moderately affected the business operation of cooperatives. Also, in the survey conducted, the majority of the participants adjusted their policies to mitigate the effect of the pandemic toward their operations. In addition, a considerable percentage of the participant cooperatives offered online services as a measure to ensure continuous delivery of services to their members.

Cooperatives have enumerated some concerns on what may be the challenges they will face in their recovery from the

pandemic, and one common concern is the market change brought by the demand of transitioning to digitalization. If left unaddressed, other areas of concern may also emerge such as a decrease in sales or income, difficulty in loan collection, and transportation and communication (16).

With a focus on boundary crossing services, the impact of IT infrastructure services on the implementation of business processes is discussed. The study examines a company in developing markets using an empirical case study and contrasts it with four strategically similar organizations from various industries. The majority of the data was collected qualitatively, with strong support from secondary sources. The needs are the same in mature and growing markets. Pricing is thought to be a key factor in choosing service providers, with service security not being a top priority for the firm. Information sharing and control are effectively made possible by the quantity of boundary crossing services. These services are the key to streamlining the implementation of business processes. The findings have consequences for both technical and business managers with regard to long-term planning of the IT strategy and creation of suitable infrastructure in accordance with process requirements (17).

#### **1.4.4 Organization and management**

In connection, most businesses, big or small, have an IT department that manages any arising technological challenges. They could be thought of as the people who reset the computer or visit your station to reinstall new software. Although they occasionally carry out these activities, they're considerably more important to a company's success because they carry out much more work than is generally known (2022).

#### **1.4.5 IT strategy**

Consequently, IT strategic plan should outline a mission statement that states what it plans to achieve and how the IT strategy relates to the organization's overall business objectives. The mission statement for the IT strategic plan should describe what it hopes to accomplish and how it connects to the organization's overarching business goals. Reviewing the organization's strategic plan is frequently the first step in developing an effective IT strategic plan because it aids in identifying the areas where the usage of technology might enhance operations (18).

#### **1.4.6 Systems configuration**

In addition, systems engineering uses the phrase "system configuration" to describe the numerous devices, processes, and computer technology that make up the complete system. This word covers the organization of hardware and software, and how each device, piece of software, or procedure interacts with one another. These settings are stored in a system settings file that is either automatically generated by the system or specified by the user (19).

In addition, companies use EDI (electronic data interface) to digitally transfer information in a standardized format from one business system to another. e-Commerce platforms, ERP systems, WMS systems, content management systems, accounting software, and more are a few of the business system types that EDI can connect to. Order processing, transactions, and communications that were formerly handled by paper or fax are now done through EDI. It is a crucial element for business process automation. One can share digital data and transactions with other companies using EDI for faster and more accurate communication. Purchase orders, invoices, advanced ship notices, and other documents can be transmitted digitally via EDI, for instance (20).

#### **1.4.7 Disaster recovery and business continuity planning**

Also, a disaster recovery plan outlines the precise actions and processes important departments' staff members must do in the event of a disaster. A business continuity plan uses the business impact analysis (BIA) to assess the risks to the vital processes, persons, and facilities that must be safeguarded in the case of an emergency structure and set priorities for the systems being used for healing (21).

#### **1.4.8 System Development and Change Control Methodologies**

Consequently, the process of defining, creating, testing, and implementing a new software application or program is known as systems development. The internal production of specialized systems, the development of database systems, or the procurement of third-party developed software could all fall under this category. All information systems must follow written guidelines and standards processes are performed. The management of the organization must establish and enforce standards and adopt an appropriate system development life cycle approach to guide the creation, acquisition, implementation, and maintenance of computerized information systems and related technologies (22). In connection, change management is becoming a more important topic as it is challenging to foresee changes and they tend to happen more frequently. Human potential should be a factor that is crucial in dealing with changes, regardless of how a new information system is developed or how its deployment is planned. Changes are unavoidable, especially in a complex, formative, and changing information system development project, so effective and documented change management is essential to the project's success (23).

#### **1.4.9 Computer operations**

Lastly, the business education programs include a lot of instruction on computer operations. With the aid of a range of software, including word processing, spreadsheets, databases, accounting, and desktop publishing, students learn how to use computers in a contemporary computer lab (24).

#### 1.4.10 Technology access

Digital literacy and information literacy have received much attention recently, and they are now recognized as critical organizational strategic resources and skills that employees must have in order to be successful in their roles. It seems, though, that current research downplays the significance of staff literacy. Nikou et al. (25) looked into how employees' impressions of the usefulness and usability of digital technologies and, consequently, their intention to integrate technology into their work practices are influenced by information and digital literacy. The outcome showed that while the perceived usefulness of technology was unaffected, perceived ease of use was directly impacted by both information literacy and digital literacy. The results also demonstrated that both literacies, via attitude toward use, have an indirect influence on the intention to utilize digital technology at work (25).

Technology access is a collection of knowledge, abilities, and attitudes necessary for effectively utilizing ICT and technological media to accomplish activities and acquire knowledge. On the other hand, Karsenti et al. (26) defined the term as "a set of abilities necessary for the confident, critical, and creative use of technological technology to accomplish goals in the fields of study, job, recreation, and social inclusion or participation in the society." There is widespread consensus that for graduates to possess the necessary technological competencies and to be prepared as global citizens, these competencies and ideals must be instilled in them beginning in primary school and continuing throughout their education (26).

Technology access is the most recent concept describing technology-related skills. During recent years, several terms have been used to describe the skills and competence of using digital technologies, such as ICT skills, technology skills, IT skills, 21st-century skills, information literacy, digital literacy, and digital skills. These terms are also often used as synonyms, e.g., digital competence and digital literacy (2011).

#### 1.4.11 Operations management

Operations management is the administration of the area of a company in charge of producing goods and/or services. Examples of these products and services can be found all around anyone. The operations function of one or more firms is involved in every book one reads, every video one watches, every email one writes, every phone call one makes, and every medical treatment one receives. Additionally, everything one uses to access the Internet, travel, sit, and dress has a carbon footprint (27).

Also, it is the management of processes that turn inputs into goods and services that provide value for the consumer. The objective of operations management is to produce goods and services that successfully meet customer needs while maximizing efficiency (28). According to (28), whether one intends to work in the operations industry, there are many career-related reasons to be interested in learning about

operations management. This is so because operations have an impact on or are an impact on every area of business. The two line functions of a company organization are operations and sales. The two line functions are supported by all other functions, including accounting, finance, marketing, IT, and so forth.

The concept of creating value today is largely influenced by the vision of ecosystems interacting intelligently and independently. The pervasive experiment of digitizing essentially every operational function recognizable in enterprises rings the death knell for conventional software and methods to manage manufacturing along whole supply chains. Such drastic business changes frequently rest on the application of big data approaches to generate value for the organization by optimizing, adapting, or drastically changing the operations model. Due to the digitization of digital goods and services, which increases convenience and productivity due to the intelligent interpretation of gathered data connected with autonomous process flows, expectations of both current and potential new customers across nearly all industries are rising (29).

In the business world, communication plays a very important role in maintaining the connection between workers, suppliers, and customers. Therefore, the utilization of IT changes the ways to communicate through email, video chat rooms, or social networking websites. Organizations have to maintain enough stock to satisfy demand while not financing more than they need. Inventory management systems establish the number of every item a corporation maintains and associate degree order of further stock by employing a means of inventory management. It has become additionally necessary as a result of the organization's having to maintain enough stock to satisfy client demand. By utilizing IT in inventory management, it can help track the amount of every item a corporation uses in managing inventory (8).

According to Aman (8), in a very dynamic business atmosphere, the accounting profession ought to traumatize completely different, diverse new problems. As an example, a way to record innovative business transactions, expand added business and knowledge processes, distribute valuable information to a broad cluster of data users, and supply assurance services across an entire variety of economic activities. ICT have drastically altered the means by which businesses perform. Now, most corporations use accounting information systems in running their operations. Developments in IT have radically increased accounting systems. Computers and alternative digital technologies have amplified workplace productivity, facilitating the quick exchange of documents and the gathering and analysis of information (8).

#### 1.4.12 Cooperatives

The International Cooperative Alliance (ICA) defines a 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.” Cooperatives in the Philippines have grown rapidly in the past decades. Based on the statistics of CDA, the number of cooperatives increased to 18,848 in 2020 (16).

An independent government agency known as the CDA was created on March 10, 1990, through the passage of Republic Act No. 6939, or the CDA Charter to provide general supervision and control over all cooperatives in the country. The CDA is a proactive and responsive lead government agency for the promotion of sustained growth and full development of the Philippines cooperatives for them to become broad-based instruments of social justice, equity, and balanced national progress.

Under CDA Memorandum Circular No. 2007-07 entitled “Revised Categorization of Cooperatives as Amended,” cooperatives are categorized based on their total assets. Cooperatives with assets of P3,000,000 and above are considered micro, 3,000,001 to 15 million as small, P15,000,001 to 100 million as medium, and above 100,000,001 as large. Based on the statistical data of the CDA-Central Office, there were 18,581 registered cooperatives in the Philippines.

According to the University of Wisconsin Center for Cooperatives, cooperatives are defined by the type of members who own the cooperative such as consumer cooperatives that are owned by members who purchase goods or services that they need, worker cooperatives are businesses that are owned by their workers, producer cooperatives owned by people who produce similar types of goods or services, purchasing cooperatives that combine member demand to achieve better pricing, availability, and delivery of products or services, and multi-stakeholder cooperatives also referred to as hybrid or solidarity model cooperatives, multi-stakeholder cooperatives are owned by two or more types of members who have different roles and interests in an enterprise that more broadly benefits them all.

In the Philippines, there are different kinds of cooperatives. In general, these are credit cooperative, which promotes thrift and savings among its members and creates funds to grant loans for productivity; consumer cooperative, the primary purpose of which is to procure and distribute commodities to members and non-members; producers’ cooperative, which undertakes joint production whether agricultural or industrial; service cooperative, which engages in medical and dental care, hospitalization, transportation, insurance, housing, labor, electric light and power, communication, and other services; and multipurpose cooperative, which combines two or more of the business activities of these different types of cooperatives (30).

#### **1.4.13 Cooperative workforce**

Per Cooperative Annual Progress Report Information System (CAPRIS) of 2019, a total of 33,178 or 58% women

(female) members outweigh the total of 24,317 or 42% men (male) cooperative members. This data shows how women dominate the membership of the cooperative movement. The data on employees of the cooperative also shows that most women members are taking part in the operation of cooperatives. From a total of 570 (full-time and part-time) employees, 326 are women and 244 are only men. This confirms the major contribution of women in the workforce of the cooperatives (31).

The Millennial Generation, a demographic categorization for those born between 1981 and 1996, is frequently a topic of debate. This generation has often been depicted in a negative light. Conversely, millennials are also described as one of the most adaptive and creative generations. When one presents those traits positively and confidently, one can increase the likelihood of impressing future employers (32).

Cooperatives and social enterprises are able to and do create good jobs as well as successful employment outcomes. They reportedly accomplish this by adopting the human resource strategies that are popular among large, established corporations. In this way, cooperatives and social businesses greatly advance the policy goals of fair work, inclusive growth, and sustainable development that are outlined in the social rights (33).

Dela and Obillos (34) mentioned the necessity of acquiring technological know-how through ICT in the 21<sup>st</sup>-century arena may have been considered extremely important by novice and experienced language teachers—the reason why they “strongly agreed” on the said premise. On another note, the idea that radical changes should be initiated in the school to accommodate ICT use was also perceived as necessary by both subjects. Hence, the novice language teacher “agreed” with it, while the experienced language teacher “strongly agreed.” ICT must be used and taught in powerful and meaningful ways. This may only be done through changing curricular standards for ICT, or, as he called it, a result-oriented paradigm shift (34).

In the concept of technology access, the study of Ramos (35) used the parameters skills, literacy, and attitude to measure the level of technology preparedness of the informants. The study showed that informants that had high levels of technology access, attitude, skills, and literacy have significantly affected the level of implementation of management functions in terms of planning, organizing, leading, and controlling.

Gender differences in information and communication technology use and skills: a systematic review and meta-analysis revealed that most of the research was conducted on gender-based ICT differences in the use and skills. It is worth noting that the education sector serves as a sample for comparing ICT differences. Meta-analysis did not reveal gender differences in ICT use and skills and support, in part, the existing body of research (36).



## 2 Methodology

The study used the quantitative method of descriptive–correlational research design. Descriptive research is used to describe the characteristics of a population or phenomenon being studied. It addresses the “what” question, the characteristics used to describe the situation or population are usually some kind of categorical scheme also known as descriptive categories, and it’s generally preceded by explanatory research. This study used a descriptive design to determine the respondents’ profiles and cooperatives’ profiles. Also, the descriptive design was also used to determine the level of ICT access of the cooperative personnel and the extent of ICT infrastructure use by the cooperatives.

The study was conducted in the province of Nueva Vizcaya, specifically in the urbanized municipalities of the cooperatives duly registered with the CDA. Based on the 2020 list of Provincial Cooperatives and Enterprise Development Office (PROCEDE) there were 65 registered cooperatives in the province. Notably, 16 of the registered cooperatives were medium and large cooperatives located in the urbanized municipalities of Solano, Bayombong, and Bambang.

This study determined the operations management of ICT of cooperatives in the urban municipalities of Nueva Vizcaya. Although there were 65 registered cooperatives based on the latest data gathered from the CDA, the respondents of the study were the medium and large cooperatives in urban municipalities of Nueva Vizcaya to establish the presence of ICT in their operations considering their asset size. The structured questionnaires were completed by a representative of the selected cooperatives, specifically the general managers, marketing officers, loan officers, and it officers of the cooperatives, who will serve as the respondents of the study.

Simple random sampling (SRS) was used in the selection of the participants for the study. It is the basic sampling technique where a group of subjects is selected from a larger population with an equal chance of being included in the sample.

A total of 45 personnel were the participants in the study, which was obtained using Slovin’s formula with a 5% margin of error.

A survey questionnaire for the cooperative personnel was prepared to satisfy the objectives of the study. This questionnaire was approved by the panel members, industry experts, and further validated with the use of Cronbach’s alpha application with an overall reliability of 85.3%. After removing some of the equations, the result indicated a high internal consistency of the instrument. The result and computation of the Cronbach’s alpha can be found in the appendix of the study.

In conducting the survey, the researcher followed a series of steps to obtain the primary data, which was processed and used in this study. The researcher initially secured permission

duly noted by the researcher’s adviser for the conduct of the study from the college dean. The questionnaire was reviewed by the researcher’s adviser and panel committee, industry experts, and further validated with the use of Cronbach’s alpha application.

The data in this study were subjected to a comprehensive analysis using descriptive and inferential statistical techniques. Descriptive statistics, such as frequency and percentage distributions, were employed to determine the characteristics of both the cooperative personnel and the cooperatives themselves. These distributions provided a detailed overview of the profiles under investigation. Additionally, measures of central tendency (mean) and dispersion (standard deviation) were calculated to provide a quantitative description of the extent of ICT infrastructure utilization and the level of ICT access among the respondents.

The article identified areas for improvement and proposed strategies to enhance cooperative operations by focusing on two key aspects: the utilization of ICT infrastructure and the level of ICT access among cooperative personnel. Additionally, the study aims to explore the interrelationships between these variables to gain a comprehensive understanding of their impact on cooperative performance.

To achieve these objectives, a descriptive–correlational research design was employed. The study involved the distribution of survey questionnaires to a sample of 40 cooperative personnel from 15 cooperatives located in the province of Nueva Vizcaya. The questionnaire consisted of six parts, each serving a specific purpose. The first part collected data on the profiles of the cooperative personnel, while the second part gathered information on the profiles of the cooperatives themselves.

The third and fourth parts of the questionnaire focused on assessing the extent of ICT infrastructure utilization by the cooperatives and the level of ICT access among cooperative personnel. The third part examined technology skills and literacy, while the fourth part delved into the attitude of cooperative personnel toward ICT.

Furthermore, the study included a fifth part dedicated to exploring the issues and problems encountered by the cooperatives, providing valuable insights into areas requiring improvement. Lastly, the sixth part of the questionnaire solicited information on recommended actions that could be implemented to enhance cooperative operations based on the identified issues and challenges. The data were then analyzed using both descriptive and inferential statistics. The frequency and percentage distributions were used to establish both the profiles of the cooperative personnel and the cooperatives. Meanwhile, the mean and standard deviations were utilized to describe the extent of utilization of the cooperatives regarding ICT infrastructure and the level of ICT access of the respondents. On the other hand, the assessments of the relationships between variables were established using both Pearson’s  $r$  correlation coefficients and

Spearman's rho correlation coefficients evaluated at the 0.05 level of significance.

### 3 Results

Sociodemographic Profile of the Cooperative Personnel of the Cooperatives. The sociodemographic profile of the cooperative personnel revealed several key insights. The cooperatives had a significant presence of female employees, with women comprising the majority of the workforce. The personnel predominantly fell within the age group of 26–34 years, indicating a relatively younger workforce. There was also a high percentage of personnel with bachelor's degrees, highlighting a well-educated workforce. Loan officers held the highest percentage among positions, emphasizing the importance of loan-related functions. The majority of personnel had been employed for 1–7 years, suggesting a dynamic workforce. Finally, there was room for further training and professional development opportunities, as most personnel had attended 0–2 trainings/seminars.

Profile of the Cooperatives in Urban Municipalities of Nueva Vizcaya. The profile of the cooperatives in the urban municipalities of Nueva Vizcaya revealed a diverse landscape of cooperative types, with multipurpose cooperatives being the most prevalent. The cooperatives are primarily engaged in providing financial and insurance services, as well as retailing, groceries, health care, and utilities. They exhibited a range of sizes in terms of total assets, membership numbers, and years in operation, indicating a mix of smaller and larger cooperatives, with some having a long-standing presence in the community. These findings highlighted the significance of the cooperative sector in meeting various needs and contributing to the socioeconomic development of the urban municipalities of Nueva Vizcaya.

ICT Infrastructure Used by the Cooperatives. The cooperatives had a moderate extent of utilization of ICT infrastructure. However, there were variations across different categories, with cooperatives showing greater utilization in systems configuration and Internet connectivity compared to organization and management and IT strategy. These findings suggested opportunities for improvement in enhancing the utilization of ICT infrastructure in various aspects of cooperative operations, such as IT resources, strategic planning, and disaster recovery measures.

Level of ICT Access of Cooperative Personnel. The cooperative personnel possessed the necessary technology skills and literacy to effectively utilize ICT tools and applications in their work. The indicators demonstrated a balanced distribution, with half of them described as a "very great extent" and the other half as a "great extent." In addition, it was found that cooperative personnel demonstrated a great extent of positive attitudes toward ICT utilization. Three indicators were described as a "very great extent," while the rest were categorized as a "great extent."

Issues and Problems Encountered by the Cooperatives. Based on the responses of the cooperative personnel, the most frequent issues encountered were related to technical issues and system maintenance, followed by Internet and connectivity problems. Training and support, as well as system functionality and integration, were also highlighted as areas of concern. These findings emphasized the importance of addressing these issues to ensure smooth operations, efficient processes, and optimal system performance within the cooperative.

Relationship between Profile of the Respondents and Level of ICT Access of Cooperative Personnel. There were significant relationships between the profile variables of cooperative personnel and their level of ICT access. The results indicated that sex and age did not have a meaningful relationship with ICT access. However, educational attainment and the number of trainings/seminars attended showed positive associations with the level of ICT access. Cooperative personnel with higher educational attainment and those who have attended more trainings/seminars tended to have better technology skills and literacy, as well as a more positive attitude toward ICT. Furthermore, the current position within the cooperative demonstrated a positive relationship with ICT access. Individuals in managerial positions within the cooperative were more likely to have higher levels of access to ICT tools and resources, both in terms of technology skills, literacy, and attitude.

Relationship between the Cooperative Profile and ICT Infrastructure Use. None of the cooperative profile variables exhibit a significant relationship with the extent of ICT infrastructure use. The type and category of cooperatives, as well as the number of members, did not show significant relationships with ICT infrastructure use. However, a moderate negative relationship was observed between the services provided by cooperatives and computer operations, indicating that cooperatives offering financial services tended to use ICT infrastructure more in this aspect. Additionally, the number of years in operation showed a moderately positive relationship with disaster recovery and business continuity planning, suggesting that as cooperatives gained operational experience, they prioritized these aspects in their ICT infrastructure use. It was important to note that these relationships were not statistically significant.

### 4 Discussion

Based on the respondents' feedback, the recommendations for improving cooperative operations could be summarized as follows. First, there was a need for system upgrades and optimization to improve existing processes and systems. Upgrading the Internet connection and information system was also crucial for better efficiency and reliability. Hiring additional IT personnel to sustain the ICT infrastructure and providing training programs and manuals of operation was essential for enhancing IT skills and knowledge

among cooperative personnel. Seeking external support through seminars and training opportunities and ensuring a reliable and fast Internet connection were also highlighted as important factors for smoother operations. These improvements were necessary to optimize the productivity of the cooperative by diverting transactional efforts by eliminating manual transaction processing and automating some processes. This would help management allocate more efforts into growing the operation by timely processing transactions with the help of ICT.

## 5 Conclusion

In line with the summary of findings, the following conclusions were provided:

1. The majority of the workforce comprised female employees. The age group of 26–34 years was the most represented, indicating a relatively younger and dynamic workforce. A high percentage of personnel had bachelor's degrees, indicating a well-educated workforce. Loan officers hold the highest percentage among positions, emphasizing the importance of loan-related functions. Personnel had attended 0–2 trainings/seminars, indicating a need for further training and professional development opportunities.
2. Multipurpose cooperatives were the most prevalent type. Cooperatives are primarily engaged in providing financial and insurance services, as well as retailing, groceries, health care, and utilities. There was a range of sizes in terms of total assets, membership numbers, and years in operation, indicating a mix of smaller and larger cooperatives.
3. Cooperatives had a moderate extent of utilization of ICT infrastructure. Utilization was higher in systems configuration and Internet connectivity compared to organization and management and IT strategy.
4. Cooperative personnel had the necessary technology skills and literacy to effectively utilize ICT tools and applications in their work. Cooperative personnel demonstrated a great extent of positive attitudes toward ICT utilization.
5. Technical issues and system maintenance were the most frequent issues encountered. Internet and connectivity problems were also common challenges. Training and support, as well as system functionality and integration, were areas of concern.
6. Educational attainment and the number of trainings/seminars attended showed positive associations with the level of ICT access. The current position within the cooperative demonstrated a positive relationship with ICT access.
7. None of the cooperative profile variables exhibited a significant relationship with the extent of ICT infrastructure use.
8. System upgrades and optimization were needed to enhance cooperative operations. Upgrading the Internet

connection and information system was crucial for better efficiency and reliability. Seeking external support through seminars and training opportunities and ensuring a reliable and fast Internet connection was important for smoother operations.

## Appendix

Slovin's formula is

$$n = \frac{N}{1 + Ne^2}$$

where:  $n$  = samples  
 $N$  = population  
 $e$  = marginal error

Substitution:

$$\frac{45}{1 + 45(0.05)^2} \quad n = 40$$

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