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## UNDERSTANDING OF THE QUALITY OF COMPUTER-MEDIATED COMMUNICATION TECHNOLOGY IN THE CONTEXT OF BUSINESS PLANNING

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### ABSTRACT

Aim/Purpose	This study seeks to uncover the perceived quality factors of computer-mediated communication in business planning in which communication among teammates is crucial for collaboration.
Background	Computer-mediated communication has made communicating with teammates easier and more affordable than ever. What motivates people to use a particular CMC technology during business planning is a major concern in this research.
Methodology	This study seeks to address the issues by applying the concept of Information Product Quality (IPQ). Based on 21 factors derived from an extensive literature review on Information Product Quality (IPQ), an experimental study was conducted to identify the factors that are perceived as most relevant.
Contribution	The findings in this study will help developers find a more customer-oriented approach to developing CMC technology design, specifically useful in collaborative work, such as business planning.
Findings	This study extracted the three specific quality factors to use CMC technology in business planning: informational, physical, and service.
Keywords	computer-mediated communication, business planning, instant messaging, information product quality, information quality

### INTRODUCTION

Computer-mediated Communication (CMC) is defined as any human communication utilizing the use of electronic devices (McQuail, 2005). CMC technologies include email, text messaging, instant messaging (IM), Social Network Services (SNS), chatting services, etc. (Ellison et al., 2007). CMC is

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one of the commonly used Information Products nowadays. An Information Product is a highly interdependent package of information that can be digitized and can be transmitted, and distributed in digital form (Shapiro & Varian, 1998). With the advent of the Internet and high-speed internet connection, CMC has been one of the most widely used communication tools and a keystone of computer-supported collaborative work. CMC technologies enable people to record/store information, reduce delays in communication, improve coordination of people remotely located, support reflection and composition of information, and improve user capabilities in information processing (Baltes et al., 2002).

Due to the necessity of using information products as a gateway for collecting data that could be exploited for marketing purposes, the design of the CMC has recently been more directed toward the needs of the businesses. For example, digital companies, using the huge amount of customers' online activity data, use predictive analytics to create new business values/opportunities. They consider consumer data as the most important data asset. Sometimes, they use the assets without the consent of customers. Recently, there has been a concern that Facebook has been collecting customers' call records and SMS data for years. However, little is known about the desires of users in the use of CMC, as well as what their main concerns in the use of CMC are. The major focus directed towards the businesses of the digital company now should be directed more towards the desires of the users. To create a new value for customers, understanding how users perceive the quality of CMC is important.

Effective communication in the workplace is key to the long-term success of an organization, and CMC plays an integral part in collaboration at the workplace. For business planning, CMC plays a crucial role in helping coworkers to communicate effectively. A collaborative team may be presented with various CMC technologies (email, phone, instant messaging, applications, etc.) for the support of distributed collaborative work. The purpose of this study is to investigate what quality factors users perceive important in using CMC in business collaboration. In this research, Nam (2014)'s information product quality model will be adopted as a theoretical framework. The framework will be used to find out which factors users perceive important in CMC use, especially in a business planning collaboration. The understanding of quality factors important in CMC use in business planning is applicable in other collaboration work as well. The right choice of CMC technology may facilitate or delay collaborative work. CMC plays a crucial role in any collaboration work these days. Therefore, the understanding of the quality of CMC in collaboration may result in better design of CMC technology.

The paper is organized in the following way: In the following section, the theoretical foundations of this research will be discussed, including a review of the features of CMC technologies and a brief introduction of the information product quality concept. In the methodology section, the research method, including instrument design and data collection, is discussed. The Data Analysis and Research Findings section will include data analysis, findings, and discussion on the findings to extend understanding to user's perception of CMC quality. Finally, I will summarize the research results and implications for researchers and practitioners and make a brief conclusion and directions for future research.

## LITERATURE REVIEW

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### *COMPUTER-MEDIATED COMMUNICATION*

CMC technologies are becoming an important tool at the workplace. People use CMC for various reasons, for example, to reduce delays in communication, improve coordination, store/record information, to reflect and compose information, improve information processing, etc. (Baltes et al., 2002). CMC is defined as any human communication utilizing the use of electronic devices (McQuail, 2005). Therefore, technologies such as email, text messaging, instant messaging (IM), Social Network Services (SNS), chat rooms, and blogs can be considered as CMC technologies (Ellison et al., 2007; McQuail, 2005). Various software tools have been changing the way we communicate and

collaborate at the workplace, ensuring that physical barriers are no longer problematic for communicating purposes. One innovative example is the Virtual Reality Conference, which combines 360 videos and VR technology to create a VR teleconference system that gets as close as possible to actually being located in the same place.

As more and more companies continue to find ways to embrace more innovative communication tools, the possibilities for new and innovative solutions will continue to grow. According to 2005-2016 American Community Survey (US Census Bureau) data, regular work-at-home, among the non-self-employed population, has grown by 140% since 2005, nearly ten times faster than the rest of the workforce or the self-employed. Larger companies are most likely to offer telecommuting options to most of their employees. Fortune 1000 companies are entirely rearranging their space around the fact that employees are already mobile. Studies repeatedly show employees are not at their desks 50-60% of the time. All kinds of telecommuting tools are on the rise. One hundred three percent increase from 2005-2016 alone (Global Workplace Analytics, 2018).

In this study, CMC use in business planning is the focus. People may consider using various types of CMC technologies, such as email, text messaging, instant messaging (IM), Social Network Services (SNS), chat rooms, blogs, etc. Media richness theory (Daft & Lengel, 1986) classifies communication technology along a continuum of "Richness," Richness implies capabilities to carry visual social cues, provide rapid feedback, and convey personality. Therefore, each medium may show a different capability to communicate complex messages. Comparably, lean media are less effective for communicating complex issues than rich media. Some people may prefer to utilize the richer CMC technology for communication since it incorporates more cues to increase communication performance. Others may prefer to choose lean media for certain tasks, considering social influences and geographic distribution. For example, people may choose lean medium over rich medium to prevent embarrassment or to avoid upsetting others. Fulk et al. (1990) found that social influence (user's social work and social circle, peer pressure, culture difference, and previously developed context-specific mental schemas) has a strong influence on CMC media use.

Instant Messaging, like Skype, iMessage, Telegram, Facebook Messenger, WhatsApp, etc., is getting popular as it shows multimedia functions, such as text, voice, video transmission, with a capability to be aware of the online presence status of their communication partners. The most popular IM in South Korea is KakaoTalk. Among various IM applications, 95% of the estimated 43 million smartphone users in South Korea mainly used KakaoTalk in 2017 (The Korea Herald, 2017). KakaoTalk users can share photos, links, videos as well as free video/audio calls, group chats, and messages. The app may automatically synchronize the user's contact list on their smartphones with the KakaoTalk contact list. Users can search for people by KakaoTalk ID without a phone. The app has a built-in browser, so users can open links and view websites while using the app. KakaoTalk has targeted countries in Southeast Asia as well, such as Malaysia, Indonesia, Philippines.

Email is mainly transmitting/receiving text and attachments. As an asynchronous CMC technology, it is not possible to check the online presence status of their partners. Social Networking Services (SNS) is a technology that enables users to share their interests, personal life, and stories with friends, acquaintances, and even with strangers. SNS allows users to upload text, pictures, audio, videos, news, and programs. Users can adjust privacy settings to select the audience before they share the content. SNS companies, such as Facebook, Twitter, Instagram, etc., are getting popular and driving a huge volume of traffic.

Researchers have examined the role of CMC technology in various organizational settings. Scheibe and Gupta (2017) found that computer-mediated socializing generates higher organizational creativity than low computer-mediated socializing when an organization has a rational culture. Rational culture is the organizational culture in which accomplishment/productivity/impact/profit is highly valued (Scheibe & Gupta, 2017). Sirait and Zellatifanny (2020) investigated the patterns and the effectiveness of computer-mediated communication and

collaboration among government employees during the Covid-19 pandemic. The results show that most employees have used instant messaging, online meeting applications, email, and document sharing tools to collaborate remotely. Tate et al. (2019) measured dimensions of employee engagement among telecommuting knowledge workers in the US using the five subscales of the Computer-mediated Communication (CMC) competence model (i.e., expressiveness, attentiveness, efficacy, knowledge, & motivation). They found that the most significant predictor of engagement was attentiveness, followed by expressiveness and then motivation (Tate et al., 2019).

CMC allows individuals to interact and share ideas with each other regardless of their physical location, so it may play an important role in enhancing business planning outcomes. Even though literature shows that there are various CMC technologies available and popularly used, and each CMC technology has different capabilities, functions, and different levels of Richness, there has been little research work in examining quality factors of CMC technology that may be perceived as important for collaborative work.

### ***BUSINESS PLANNING***

Entrepreneurship courses have become one of the essential courses in many business schools. Honig (2004) examined the 2004 college catalogs of all of the top 100 universities in the United States for courses that specifically referred to Entrepreneurship in their course description. He found 78 of the top 100 universities offered such courses. Entrepreneurial education programs have a positive effect on the perceptions of the desirability and feasibility of starting a business (Peterman & Kennedy, 2003). This process is driven by the expectation that the university can be an engine to stimulate local economic growth and social well-being, and university management seeks to expand the university funding base in accord with governmental policies and initiatives (R. Graham, 2014).

In entrepreneurship courses, students learn how to write a business plan. A business plan can be defined as a written document setting out a business's objectives and describing in detail, including business goals, an industry and competitor analysis, an examination of environmental trends/resources, the organizational and financial strategies, and detailed activities of marketing, operation, production, and management. As the course content includes case materials, simulations, and various “hands-on” approaches (Gorman et al., 1997), teaching how to write a business plan and monitoring of the production is identified as being the most important course feature of entrepreneurship courses (Hills, 1988). Business planning projects require a significant amount of collaborative effort among team members. Students typically work in groups to write a business plan. They present the business plan in the classroom to demonstrate the feasibility and quality of the plan. The instructors assess each team's achievement to see if each team effectively integrates course knowledge into the plan. To complete several weekly tasks to build a business planning, on-site or virtual meetings must take place. The management of the collaboration includes assembling, scheduling/ coordinating meetings, monitoring of tasks completed, etc. If team members are distributed in different locations to collaborate towards a shared goal, CMC technologies play the role of a communication platform to accomplish a task. A proper communication tool decreases the risk of communication breakdowns and increases the chances to build a shared context. The business planning project follows similar procedures of real-life business planning, as students are expected to generate a business plan at the end of the semester for grading. Some limitations of this setting include lack of funding/resources/budget. For example, the subjects are students, so they prefer freeware to purchased software.

### ***CONCEPTUAL MODEL OF INFORMATION PRODUCT QUALITY (IPQ)***

An information product is an interdependent package of information that can be digitalized, transmitted, and distributed in digital form (Shapiro & Varian, 1998). An information product has quality when it is beneficial to information product recipients. Crosby (1980) defines quality as “conform-

ance to requirements.” Deming defined quality from the customer's point of view as “satisfying customer's requirements” (Deming, 1986). The Information Product Quality concept will be adopted to measure the perceived quality of CMC. Any information product consists of three components: informational, physical, and service components (Alter, 2002). As a kind of Information Product, a CMC technology also has three components: informational, physical, and service.

Eppler’s concepts of content quality and media quality are used to explain information and physical components, and SERVQUAL explains the service component of information product quality. Information Product Quality consists of three components: informational, physical, and service components. Informational components include comprehensiveness, accuracy, clarity, applicability, conciseness, consistency, correctness, and currency. Physical components include convenience, timeliness, traceability, interactivity, accessibility, security, maintainability, and speed. Service components include reliability, responsiveness, assurance, empathy, and tangibility. Nam (2009, 2014) tested the Information Product Quality model in the use of different types of information products, which is a general web portal. In this research, a total of 21 quality factors will be considered to measure CMC quality in business planning (Table 1).

**Table 1. Conceptual Model of IPQ**

<b>Information Product Quality (IPQ)</b>	
Informational components	C1: Comprehensiveness C2: Accuracy C3: Clarity C4: Applicability C5: Conciseness C6: Consistency C7: Correctness C8: Currency
Physical components	C9: Convenience C10: Timeliness C11: Traceability C12: Interactivity C13: Accessibility C14: Security C15: Maintainability C16: Speed
Service components	C17: Reliability C18: Responsiveness C19: Assurance C20: Empathy C21: Tangibility

The quality of CMC also can be examined in three components. Physical components are the materials that hold data in a certain form or that allow data to flow. In this study, hardware or software that

may hold, present, and deliver data in any form or that may allow data to flow is considered as a physical component. Information components are contents that users try to deliver. Service components are sets of actions that create values to users that do not include information nor physical components.

## RESEARCH QUESTION

The most popular CMC technologies are Instant Messaging, email, and SNS (Ku et al., 2013). In this study, text messaging and telephone are also included. By adopting Nam (2009, 2014)'s information product quality model, this study investigates the following research question.

Research question: What quality factors are perceived as important in the use of CMC technologies in business planning?

In other words, given many factors that were discussed in the literature on information quality, which one would be pertinent to CMC use in business planning? In this study, the quality of CMC—as an information product—was examined from the perspective of end-users. Nam's Information Product quality model (2014) incorporated Eppler's (2003) information quality model and SERVQUAL. The definition of each quality factor in Nam's study was utilized in this study. A total of 21 quality dimensions are examined in this study. They are comprehensiveness, accuracy, clarity, applicability, conciseness, consistency, correctness, currency, convenience, timeliness, traceability, interactivity, accessibility, security, maintainability, speed, reliability, responsiveness, assurance, empathy, and tangibility. The list of dimensions appears in Table 2.

**Table 2: Information Product Quality (IPQ) Attributes**

Quality components	Quality attributes	Description
Informational components	Comprehensiveness	Is the scope of information adequate (not too much nor too little)
	Accuracy	Is the information precise enough and close enough to reality?
	Clarity	Is the information understandable or comprehensible to the target group?
	Applicability	Can the information be directly applied? Is it useful?
	Conciseness	Is the information to the point, void of unnecessary elements?
	Consistency	Is the information free of contradictions or convention breaks?
	Correctness	Is the information free of distortion, bias, or error?
	Currency	Is the information up-to-date and not obsolete?

Quality components	Quality attributes	Description
Physical components	Convenience	Does the information provision correspond to the user's needs and habits?
	Timeliness	Is the information processed and delivered rapidly without delays?
	Traceability	Is the background of the information visible? (author, date, etc.)
	Interactivity	Can the information process be adapted by the information consumer?
	Accessibility	Is there a continuous and unobstructed way to get to the information?
	Security	Is the information protected against loss or unauthorized access?
	Maintainability	Can all of the information be organized and updated on an ongoing basis?
	Speed	Can the infrastructure match the user's working pace?
Service components	Reliability	Is the service able to perform its functionality accurately?
	Responsiveness	Is the service willing to help and provide its functionality in an immediate form to the users?
	Assurances	Is the service able to convey trust and confidence?
	Empathy	Is the service able to provide caring and individual attention?
	Tangibility:	Does the service contain all the software and hardware infrastructures needed according to its functionality?

## SUBJECTS AND PROCEDURE

Entrepreneurship is one of the mandatory courses for an undergraduate student enrolled in Ulsan National Institute of Science and Technology, South Korea. In this study, data were collected from undergraduate students who are taking the mandatory entrepreneurship course at the UNIST. Partici-

pation in this study was voluntary, and subjects were rewarded with extra course credits for their survey participation. The school (Ulsan National Institute of Science and Technology) required approval by a Human Subjects College, and IRB approved this study with EXEMPT from ongoing review.

The participants evaluated the perceived quality of CMC and the actual choice of CMC. A self-administered survey was done right after taking the “Entrepreneurship and innovation” course at the end of the semester. Subjects were asked the choice of CMC used the most in business planning projects. Subjects also evaluated the quality of the CMC, which they chose for their business planning collaboration. The scale in the Nam (2014)'s study was used with suitable modifications in a business planning project context to measure the perceived quality of CMC. To evaluate the quality of the

CMC, the questionnaire also asked participants to rate the extent to which they agree on a seven-point scale (anchored by 1: extremely unlikely, and 7: extremely likely).

## **DATA ANALYSIS AND RESEARCH FINDINGS**

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### ***DEMOGRAPHICS***

Two hundred eighteen undergraduate students—162 males (74%) and 56 females (26%)—enrolled in MGT102 Entrepreneurship courses at the Ulsan National Institute of Science and Technology during either the Spring or Fall semester in 2018-2019 participated in the survey. The average age among participants was 23.1 years old, with the youngest being 19 and the oldest being 28 years of age. The age of the majority of participants (91%) ranged between 20 to 25 years old.

94% of the subjects had their own laptop, and 29.4% of the participants had their own Tablet PC. All participants possessed their own smartphone. As a favorite mobile device in business meetings, 39% of participants indicated laptop, 12.4% picked the mobile phone, and 33.5 % participants chose both laptop and mobile phone at the same time. Most of the participants (about 90%) have less than seven years of experience in mobile device use. The average year of mobile device use is 4.3 years, with a standard deviation of 7.2 years.

### ***EXPLORATORY FACTOR ANALYSIS***

To test and find the significant quality factors in CMC use, Exploratory Factor Analysis (EFA), using SPSS, was conducted with maximum likelihood extraction with iterations. Varimax rotation was specified to identify variables that might indicate potential constructs. Prior to performing the analysis, the accuracy of data entry, missing values, normality, and outliers was checked. This study conducted Exploratory Factor Analysis (EFA) in examining the validity of the instrument. EFA is usually conducted to identify and organize a large number of items of the questionnaire into the constructs under one specific variable (Chua, 2014).

Construct validity is the extent to which an empirical measure effectively tests the real meaning of concepts under consideration (Babbie, 1990). If the Kaiser-Meyer-Olkin (KMO) is greater than 0.6 and the Barlett's Test of Sphericity (BTS) is significant at  $\alpha < .05$ , then it is believed that the sampling is adequate to proceed for factor analysis (Hair et al., 2010; Tabachnick & Fidell, 2007).

Four factors with eigenvalues over one were obtained. The four factors explained 58.72 percent of the variance. The reliability estimation for each quality factor is .830, .820, .812, and .630. As Cronbach alpha values of 0.7 or higher indicate acceptable internal consistency, the fourth factor (Cronbach value is below 0.7) is dropped. The other three factors are named Physical, Information, and Service. The three factors explained 53.82 of the total variance. All of the values are statistically significant ( $p < .05$ ). Each of Cronbach's alpha data analyzed is summarized in Table 3. Table 3 displays the rotated loading for these factors. Data supports the original structure of the research



model. KMO was 0.916, it is greater than 0.6, and BTS is significant at  $\alpha = .000$ , so it ensures the sampling adequacy for factor analysis.

**Table 3: Factor Loading Results**

Factors	Attributes
Factor1:Physical (Cronbach's alpha=.830)	C16: Speed (.719) C13: Accessibility (.717) C10: Timeliness (.701) C9: Convenience (.854) C12: Interactivity (.840) C19: Assurance (.586)
Factor2:Information (Cronbach's alpha=.820)	C5: Conciseness (.724) C1:Comprehensiveness (.709) C3: Clarity (.686) C2: Accuracy (.656) C6: Consistency (.502)
Factor3:Service (Cronbach's alpha=.812)	C17: Reliability (.759) C20: Responsiveness (.743) C18: Assurance (.592) C21: Tangibility (.542)

### ***CONFIRMATORY FACTOR ANALYSIS (CFA)***

The three factors were confirmed through a measurement model in AMOS 26 graphics. This model was expected to provide factor validity in this study. The AMOS 26 Maximum Likelihood solution algorithm was used to estimate model parameters.  $\chi^2(87)$  of the model was 181.655 ( $p=.000$ ). In addition, TLI=.898 (appropriate), CFI=.926 (appropriate), the Root Mean Square Error of Approximation (RMSEA) = 0.071(good), 90 Percent Confidence Interval for RMSEA = (0.056; 0.085), and P-Value for Test of Close Fit (RMSEA < 0.05) = 0.000. AMOS 26 uses Maximum Likelihood for the analysis of missing data. Chi-square value (181.655) / df (87) < 5, so this model is appropriate.

When the standardized factor loading of each item is higher than statistically significant levels, then good convergent validity exists (Dunn et al., 1994; Anderson & Gerbing, 1988). In Figure 1, each variable exhibits significant loadings which support convergent validity.

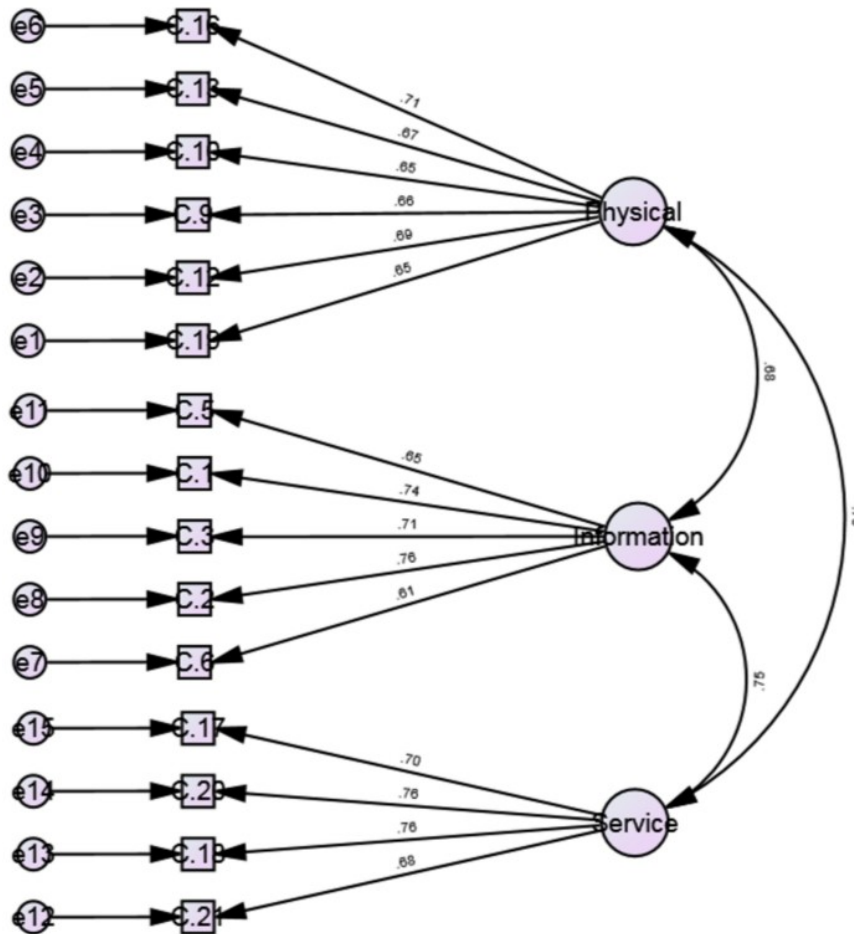


Figure 1: Standardized Factor Estimates

For discriminant validity, the estimated correlation parameter  $\Phi_{ij}$  between one pair of components was constrained to 1.0, and a  $\chi^2$  difference test was conducted on the values obtained from the constrained model and the unconstrained model. A chi-square difference test was conducted for each possible pair of the three factors at any given time (Anderson & Gerbing, 1988). The unconstrained model shows a significantly lower value of  $\chi^2$  ( $(\chi^2(1)=10.83, p<.001)$ ) than all the constrained models (see Table 4). Therefore, the factors possess discriminant validity.

Table 4: CMT Quality Factors

Factors con- strained to unity	X <sup>2</sup>	df	p	$\Delta X^2$	$\Delta df$
unconstrained	181.7	87	0.000		
12	217.1	88	0.000	35.4	1
23	204.4	88	0.000	22.7	1
13	202.2	88	0.000	20.5	1

## RESULTS & DISCUSSION

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As a major CMC technology used in business planning collaboration, Instant Messaging was chosen by the participants (82.6%), with email (15.1%) and mobile phone (2.3%) ranked second and third, respectively. IM is a type of online service in which users can create a private chat room with other people to communicate in real-time. (Beal, 2019). IM is getting more popular at workplaces. IM is used to improve workflow, quality of workday, productivity, and interoffice cooperation. Shaw et al. (2007) said IM use influences positively on improving productivity in the workplace by a reduction in voice mail and phone tag, and improvement in checking if colleagues are available online to communicate (Shaw et al., 2007). C. M. Graham and Jones's research (2019) supports the same position in the use of social network messaging apps for collaborative work. They said social network messaging apps could be helpful to share a sense of common ground between team members and to engage students better and improve learning in project teamwork.

However, there is also a concern about some distractions caused by IM as well. When asked whom they contact most often at work, 40% of IM users said that they use IM to communicate with coworkers and 33% with friends and family. Another pitfall is that IM may increase gossip/rumors, so it may create a stressful situation at a workplace (Pew Research Centre, 2004).

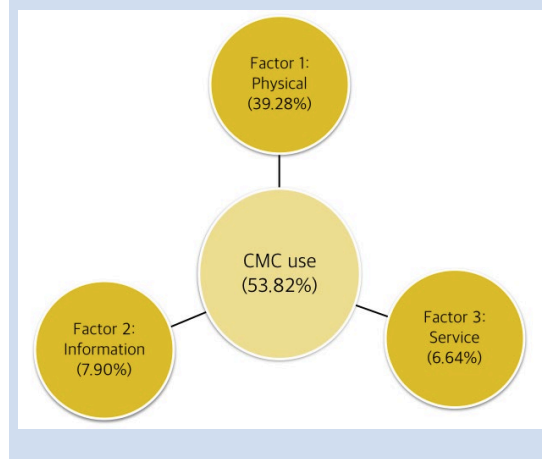
Although IM is based on text messages, the user may check if a counterpart on a private list is online and available for live chatting or not. This feature enables real-time telecommunication, and it makes IM distinct from other text messaging services. As a common feature of CMC, IM also allows users enough time to reflect on the situations and to respond accordingly.

This feature specifically appeals to the users who don't like any threatening/embarrassing situations caused by face-to-face communication. It may lead to better exploration, excitement, confidence, more engagement, and responsibility, as well as a better understanding of situations and discovery of new insight (Young, 2003).

This study is one of the few attempts to investigate student acceptance of CMC technology in business planning. In response to the call for a holistic model explaining CMC technology, we have tested a conceptual model of information product quality to explain student acceptance of CMC from an informational, physical, and service theoretical frame. This effort was successful in generating several new insights about the perceived quality nature as determinants of CMC use. Reliability of measurement items of each motivation and concern was ensured. Cronbach's alpha for each motivation and concern is  $>.70$ , and all of the values are statistically significant ( $p < .05$ ). Factor analysis using SPSS was conducted with maximum likelihood extraction with iterations to test and validate the conceptually developed three quality components. A factorial analysis has allowed the model to be rearranged. The three factors are labeled: (1) Physical, (2) Information, and (3) Service. This three-factor result supports Nam's Information Product Quality Model (2009, 2014). Different sets of quality attributes may be considered important in a different social, cultural, and situational context. Similar attempts integrating three components of quality for a holistic view of quality have been made by other researchers. Xu et al. (2013) proposed the 3Q model in the e-service context by including the Service Quality and its relationships with System Quality and Information Quality in website adoption. In their 3Q model, information quality includes four attributes (completeness, accuracy, format, currency), System Quality includes four attributes (reliability, flexibility, Accessibility, & Timeliness). Service Quality includes five attributes (Tangibles, Responsiveness, Empathy, Service Reliability, and Assurance). Kanwal and Rehman (2016) also paid attention to the three components of quality when they studied the user's satisfaction towards e-learning systems in Pakistan. They found that information quality, service quality, and system quality were the positive and significant indicators for user satisfaction. Wang and Lin (2017) also focused on these three components of quality when they investigated the effect of perceived quality on their trust in location-based services. Location-based services are a type of app that detects the location where the device is located and can provide information such as routes, attractions, and traffic conditions. As there is a privacy concern in the use of

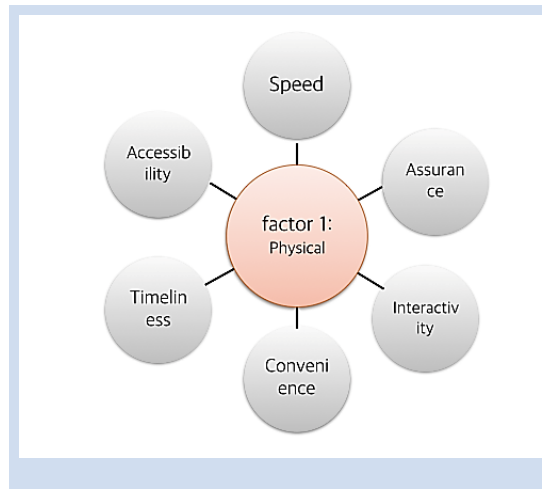
location-based services, they examined how the perceived quality of the app affects user's trust in the app. They found that the information quality, system quality, and service quality of the app were positively related to the perceived trust.

In our research, among the three factors, (1) Physical factor appeared to be the most important because it explained the largest portion (39.28%) of the total variance (Figure 2).



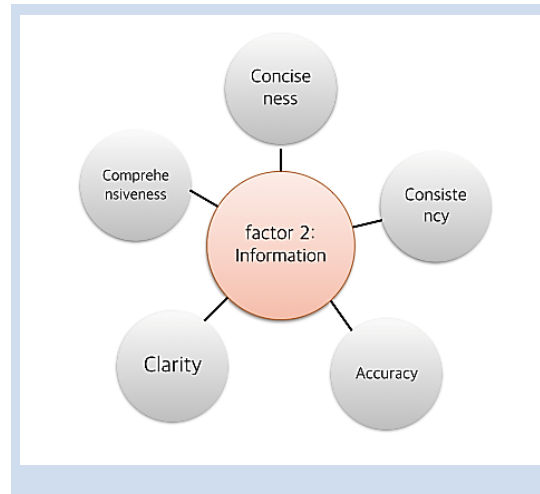
**Figure 2: Rotated Loading Results**

Physical factors were indicated by the attributes “Speed,” “Accessibility,” “Timeliness,” “Convenience,” “Interactivity,” and “Assurance.” “Convenience” is most highly correlated with a rotated loading score of .854 (Figure 3).



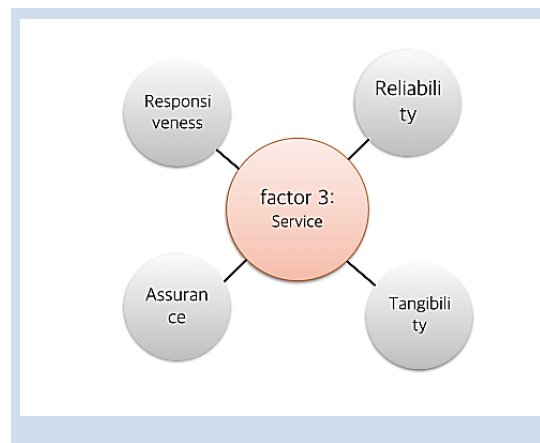
**Figure 3: Factor 1 Physical**

Information factors explained 7.9 % of the total variance. Information factor was indicated by the attributes “Conciseness”, “Comprehensiveness”, “Clarity”, “Accuracy”, “Consistency”. “Conciseness” is correlated with the highest rotated score .724 (Figure 4).



**Figure 4: Factor 2 Information**

The service factor explained 6.64% of the total variance. Service factor was indicated by the attributes “Reliability,” “Responsiveness,” “Assurance,” and “Tangibility.” “Reliability” is correlated with the highest rotated score, .759 (Figure 5).



**Figure 5: Factor 3 Service**

It is remarkable that the physical component of quality appeared the most important in CMC use for business planning collaboration. Little is known regarding the importance of physical components of quality in the use of CMC. As a user nowadays carries his/her own portable devices to access various CMC technologies, convenience seems a very important attribute measuring the CMC perceived quality. Specifically, in the use of IM for real-time communication, 'Convenience' was pointed out as the most important attribute. Major concerns of quality research still remained only in the Information component of quality.

Information quality has been pointed out as an indicator of online e-commerce customer satisfaction (Lin, 2007). Muhammad et al., tested if information quality affects online customer's commitment, and they found that information quality positively influences e-satisfaction and e-trust (Muhammad et al., 2014). Ou and Davison (2016) examined how communication quality and mutual trust contribute to the development of interpersonal relationships from working professionals in China. They found that synchronicity mediates the direct relationship between IM use and interpersonal relationship. They also found that communication quality mediates the direct relationship between IM use and trust. This finding suggests that even with the IM physically installed, employees' mutual trust cannot be achieved without quality communication. In their study, communication quality refers to

the employee's perception of the quality of communication in terms of being timely, adequate, accurate, complete, interactive, and effective.

## **THEORETICAL AND PRACTICAL CONTRIBUTIONS**

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First, given the theoretical importance of integrating information, physical, and service components of information products (Nam, 2014; Nam, 2009), three factors were identified as the most important component of CMC quality in business planning. By presenting a theory of quality on the use of CMC in business planning, our work contributes to research in multiple ways. First, our theory contributes to the literature discovering important quality factors in CMC use, specifically in business planning. Prior research has largely focused only on informational components of quality. In this study, we emphasize the importance of three components, Physical, Information, and Service components of quality, in explaining CMC use, specifically in business planning.

Second, the physical component was identified as the most important component in the use of CMC in business planning. Even though there are several attempts to integrate informational, physical, and service components of quality explaining media, major research domains remain in the focus of the information component only. This research highlights the importance of physical components in the use of CMC as 'convenience' is regarded as the key attribute in measuring users' perceived quality. Using mobile devices, people can access CMC technology in real-time. This finding points out the importance of physical quality components in the measuring quality of CMC.

Third, quality is recognized as an explanatory variable of the use of CMC in business planning. In theories based on the TAM model, the use of mandatory, work-related information systems has mostly been the focus. Therefore, the explanation has been limited in some senses. Although various quality attributes have been identified before, little is known about which quality factor is perceived as important in the use of CMC in business planning. This study shed light on quality research, specifically in the use of CMC. As the focus of our study is on user-perceived quality, we offer a user-level understanding of the use of CMC about what quality factors drive the choice of a specific CMC for collaborative works.

With the growing role of CMC technologies nowadays, our study has practical implications for enhancing CMC technology performance. This study informs the importance of 'Convenience' in CMC design to yield a higher value proposition to CMC users. The prominence of the Convenience attribute has important implications for app developers, particularly those who have tended to ignore physical factors. The significant quality attributes related to CMC use will provide insight to app developers about which features they should consider in designing CMC. Our proposed quality model can be prescriptive to managers and designers on how to design a new CMC specifically for collaborative work. Articulation of these factors would help identify potential problems that may significantly promote or hinder use when web designers, managers, and users evaluate the quality of a CMC tool.

## **LIMITATIONS AND FUTURE RESEARCH**

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The threat to external validity comes from the fact that it tested a limited number of subjects, tasks, and specific contextual situations. The student subjects may not represent a general population. Students' use of CMC technologies is tested to test CMC use in a work setting. Even if their use of CMC is for business planning as coursework, their student status may affect the choice or use of CMC. For another population, different motivational factors may appear significant. For example, the senior group of people may face more technical/physical challenges in the use of CMC (ex. optical problems) compared to the student population (Chou et al., 2013). Their perceived quality of CMC may be different. Future research will shed more light on the generality of these findings. Future studies should be extended to other populations and contextual situations in the use of CMC.

## CONCLUSION

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The purpose of this study was to examine the user's perceived quality of CMC technology in business planning. The three components (Physical, Information, and Service) were found as significant quality factors. These findings contribute to a better understanding of the use of CMC in business planning. Future studies should be extended to other populations and contextual situations in the use of CMC.

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## Quality of Computer-Mediated Communication Technology

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