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Stevan Dedijer
1911-2004

Intelligence studies as an alternative approach to the study of economics

I am sitting at home looking through two thick books used in business education a hundred years ago and wondering how they are outdated. They are full of detailed knowledge about markets, products, production, and legal issue between countries. Today everything is lifted to a more abstract level and many parts have become their proper disciplines. How successful has this change been when it comes to understanding business and economics?

The study of economics, but even business and management today, are too far removed from the reality they are trying to describe. To study economics has instead ironically become a guaranteed way not to understand much about real economics; for example, how money is created and is distributed through private banks or how the gold market works. Instead scholars know econometrics, or they adhere to some group with a favorite journal. As we know, far earlier than Adam Smith, for example with Marco Polo, at the heart of economics lies the notion of competitive advantage. In the thick books I am sifting through that notion is never lost. It's all about understanding markets to find an opportunity or a niche.

Intelligence studies suggests that the way to become competitive is to learn about the world by focusing on cultures, history, geography, people of influence, markets, resources and knowledge. There is a strong relationship of causation between the survival of companies and that of a nation state, as the latter can be seen as the sum of the former. If we take one more step, the notion of competitive advantage has always been related to the study of geopolitics, realpolitik and today what we understand by geoeconomics. It is also closer to the German and English tradition of political economy, seeing that it is counterproductive for any attempt to understand societies to separate politics from economics, or from psychology for that matter. They are all parts of the same social system, as Luhmann argues. Try to take out any part and your miss the picture. The study of culture today is part of anthropology or sociology; thus, business students seldom learn much about it. The geography they are supposed to have learned in high school (but few do). The same for history. So, it is becoming clear that too many bits and pieces are missing in our education for us to be able to draw valuable conclusions about how to make money on a grand scale.

When Austrian economists wanted to take out history from economics there was a serious battle in European universities ("Methodenstreit"). Those arguing for removing history and ever more specialization won, in part because Germany had lost WWII and the new superpower wanted to set its own rules, even in the study of people and society. The separation between micro and macroeconomics is now close to complete. And, what else is "marketing" but a subset of geography? Students today study "marketing" instead of actual markets, in Lagos or Mumbai, assuming that all are more or less the same and that the models that university professors and consultants make up are universal. "Entrepreneurship" is studied like an exciting new fruit, not as an ancient game of willpower, sweat and tears. Do these studies really help young men and women become entrepreneurs? I doubt it.

In the meantime, companies in the Western world are being surpassed by their Asian competitors, whose employees often do not have a business education. For as long as the Western world was doing well economically, no one really questioned the subjects, models and theories presented at business school. It was assumed there was some sort of correlation, I guess, even though most successful entrepreneurs had a natural science background or no diploma at all. Now things are different. A good way to start is by going back to the main question of competitive advantage. It's there that intelligence studies are, defining methods for how to understand markets and events as they unfold before us. JISIB has always tried to reflect this shift by publishing articles on markets, industries, different countries, new technologies, and especially software that shows how companies can become competitive. How to obtain a competitive advantage is still about gathering intelligence. What happened this week with the coup-d'état in Guinea when President of Guinea Alpha Condé was captured by the country's armed forces? No one at business school can tell you because they don't study that. It shows the irrelevance of most modern social science. If we really want to understand economics, we should study what happens in the world's many markets

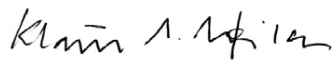
and countries. In that sense intelligence studies is a better replacement for the study of economics in its current form.

Maune's article "Intention to use mobile applications in competitive intelligence: An extended conceptual framework" use UTAUT2 constructs to show how CI mobile applications can be used effectively. Nuortimo and Härkönen's article "The first wave impact of the COVID-19 pandemic on the Nasdaq Helsinki stock exchange: Weak signal detection with managerial implications" argues that COVID-19 was not a black swan event and use a social media firestorm scale to argue why. Tulungen et al.'s article "Competitive intelligence application: The case of geothermal power plant development in rural Tompaso, North Sulawesi, Indonesia" presents a case for how CI is used in a power plant development project in Indonesia. Kula and Naktiyok's article "Strategic thinking and competitive intelligence: comparative research in the automotive and communication industries" is derived from a PhD dissertation and shows how strategic thinking and competitive intelligence can be related. Finally, Poblano-Ojinaga's article "Competitive intelligence as factor of the innovation capability in Mexican companies: A structural equations modeling approach," uses a structural equation modeling methodology to evaluate the relationships between competitive intelligence and innovation capability of Mexican companies.

As always, we would above all like to thank the authors for their contributions to this issue of JISIB. Thanks to Dr. Allison Perrigo for reviewing English grammar and helping with layout design for all articles. Again, I wish I could say that the COVID-19 pandemic is soon over, but unfortunately it still seems to have a grip on our lives.

On behalf of the Editorial Board,

Sincerely Yours,



Prof. Dr. Klaus Solberg Søilen
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Editor-in-chief

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Intention to use mobile applications in competitive intelligence: An extended conceptual framework

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ABSTRACT This article aims at identifying the key antecedents to behavioral intention and use behavior of individuals regarding mobile applications that can support competitive intelligence of firms. Attention was given to perspective antecedents in behavioural intention and use behaviour of mobile applications in competitive intelligence. A qualitative research based on a literature review of 21 peer-reviewed journal articles covering a period of six years from 2014 was used. These articles were collected from separate databases using search engines. All UTAUT2 constructs had a direct and significant influence on mobile application use. Following significance factors were ease of use, perceived usefulness, perceived enjoyment, and trust. However, perceived risk, subjective norms, and self-efficacy were insignificant. An extended model was later developed with 15 constructs. This article highlights the key determinants of user behavior regarding mobile applications that firms should act on in order to foster the acceptance of these technologies despite the privacy risks that arise. Previous research has largely ignored the influence of perceptive antecedents in the behavioural intention and use behaviour of mobile applications in competitive intelligence. This article covers this gap by drawing attention to the cognitive psychological perspective of the phenomenon.

KEYWORDS Behavioural intention, competitive intelligence, mobile applications, mobile apps, unified theory of acceptance and use of technology, use behaviour, UTAUT, UTAUT2

1. INTRODUCTION

Competitive intelligence (CI) has become a global phenomenon in today's environment of intensifying global competition because of big data analytics. This includes AI, IoT, 5G/6G, cybersecurity, as well as the adoption and use of mobile applications such as WhatsApp, Facebook, Instagram, Twitter, and Telegram that have enabled high-speed availability and transfer of large amounts of data collected and accumulated by individuals and organisations over the years. Carlos and Herrera (2021) argue that the business environment of today is complex and dynamic due to increasing global competition. People in business need to master and know all the information that has strategic value, and CI is positioned as the most appropriate tool to achieve this goal (Carlos and Herrera, 2021). Organisations and individuals alike that can transform this data into information and knowledge faster remain at the top and thus achieve a competitive edge. The advent of mobile application technologies and the wider availability of internet connections have made it easier for individuals and organizations to access large amounts of data.

Singer and Friedman (2014) argue that what constitutes the internet itself is evolving before us in an even more fundamental way. It

is simultaneously becoming bigger and far more personalized (Singer and Friedman, 2014). According to Bulao (2021) and Vuleta (2021), on average, every human created at least 1.7 MB of data per second in 2020. They predict cloud data storage around the world will amount to 200+ Zettabytes by 2025. This will be up from 2019's 4.4 zettabytes and 2020's 44 zettabytes. The two further argue that by 2025, there will be 175 zettabytes of data in the global data sphere. They further argue that in 2020 2.5 quintillion data bytes daily were created and as of July 2020, the world had 4.8 billion internet users. That is a huge increase from the 2.6 billion internet users in 2013. Mobile phones were more popular than other devices, with 4.28 billion unique users. By 2025 people will generate 463 exabytes of data and by 2030, nine out of every ten people aged six and above would be digitally active (Vuleta, 2021 and Bulao, 2021). Rather than passively receiving this onslaught of online information, the individual users are creating and tailoring sites to their personal use, ultimately revealing more about themselves online. The amount of data is on the rise with the increase in smartphone subscriptions globally.

This amount of big data is critical to decision-makers and data analysts. The use of CI has, however, become relevant now more than before. Solberg (2019) argues that CI has developed and emerged with information technology (IT) solutions over the past ten years. Most advancements and developments are now about IT solutions and applications. This has again given rise to a whole new world of intelligence-related problems and opportunities, not only for engineers but for users of these technologies (Degerstedt, 2015 and Solberg, 2019). It is probably fair to say that the intelligence perspective has never been as important for businesses as it is today, thereby refuting the notion that CI is dead or there is nothing new in the field. The use of mobile applications such as WhatsApp, Facebook, Twitter, Instagram, and Telegram to mention just but a few have both increased and strengthened the role of CI globally. Mobile apps have become big data mines for gathering intelligent information in this competitive environment.

Thus far, CI research has focused primarily on the same phenomenon, how to gather information to make better decisions (Solberg, 2019). Some research has begun to address CI from a business intelligence perspective, big data analytics, AI this time around using algorithms as a predictive tool. Previously, CI research was more concerned with web and desktop applications but now there is a rapid shift towards mobile applications due to information available anytime, anywhere from everyone who has a phone. This sudden shift has also been influenced by an increase in the number of mobile apps and the number of active users per day. Mobile intelligence has now combined BI, transactions, and multimedia. To Singer and Friedman (2014), Facebook, Twitter, Google and all the rest are, in many ways the very definition of modern life though recently, issues around privacy, information security, mass surveillance, snooping, information theft through face recognition, cancel culture, and freedom of speech have been raised. A functioning internet with freedom of speech and a good connection to the social networks of one`s choice is a sign not just of modernity, but of civilization itself (Singer and Friedman, 2014). The two further argue that this is because the internet is where people live, do business, meet, and fall in love. It has become the central platform for business, culture, and personal relationships.

Other areas beginning to draw research attention are data mining, search engine optimization, social media marketing and digital marketing in general (Solberg, 2019). Accordingly, recent literature reviews have highlighted the need to further address mobile app users' perspectives and psychology. These reviews acknowledge that the nature of users' perspectives depends on the mobile app being examined, as motivations for use are driven by different antecedents. These notions are supported by the claims that understanding the users is fundamental to understanding CI, much like understanding the decision-makers' needs is fundamental to understanding CI gathering. To Singer and Friedman (2014), to misunderstand the centrality of these services today is to make a fundamental error. The internet is no longer the luxury it was, for most people, knowingly or not, it is life.

To address this gap, this article seeks to introduce a reasoning perspective into understanding CI through a literature review of the behavioural intention and use behaviour of mobile application users. This approach acknowledges that human behaviour is influenced by mental processes, and this is how people acquire, transform and use information (Shneor and Munimb, 2019). More importantly, the article seeks to examine and

understand the drivers, motivators, and influencers of acceptance and use of mobile applications in CI. Given the availability of mobile applications across the globe, it is critical to appreciate the reasons behind the behaviour of users of these platforms in the CI process.

This study uses the extended Unified Theory of Acceptance and Use of Technology (hereafter, UTAUT2) developed by Venkatesh, Thong, and Xu (2012). This theory can be used to capture the behavioural intention and use behaviour of users of mobile apps in CI and their antecedents. It also seeks to study mobile app acceptance and use in the CI process. Venkatesh, Thong, and Xu (2012) developed the UTAUT2 as a comprehensive integrated model for better-understanding consumer acceptance toward new technology or system. To this end, the assumption is that due to the novelty of digital manifestation, privacy, information security, risk of mass surveillance, data theft, hacking, and cyberbullying, individuals involved in gathering CI through mobile apps are unlikely to engage in this behaviour without prior and preliminary consideration. Previous research has largely ignored the influence of perspective antecedents in behavioural intention and use behaviour in mobile applications use in CI. This article gives attention to the cognitive psychological perspective of this phenomenon with the knowledge that personality affects behaviour. The underlying aim of this study is to identify the predictors of behavioural intention and use behaviour of CI professionals and experts in using mobile applications in intelligence gathering for decision-making. An extended framework, UTAUT2 is presented as the basis for identifying behaviour intention and use behaviour predictors in using mobile applications in intelligence gathering by CI professionals and experts. The starting point is appreciating these predictors of behaviour first since this behaviour has a strong bearing in the adoption and use of technology: in this case, mobile applications.

The article follows a systematic literature review on mobile application use for CI through the lens of UTAUT2. An exploratory design was followed to confront UTAUT2 with extant studies on mobile application use for CI. The study focused more on the perspective antecedents in behavioural intention and use behaviour of mobile application use in CI. The study highlights the key determinants of user behaviour regarding mobile applications. Identifying the determinants of user behaviour regarding mobile application use for CI enables firms to act appropriately in order to foster the acceptance and use of the mobile technologies despite the privacy risks associated with their use, thereby creating a virtuous cycle for the development of CI practices. The findings have both managerial and practical implications; their contribution is scientific, practical, societal, political, and educational.

The remainder of this article is as follows. First a review of the literature regarding the mobile application acceptance and use, and users' perspectives and psychological aspects in CI. A literature review is done to understand the reasons or influencers of mobile apps user behavioural intention and use in CI and how relevant the UTAUT2 framework is in this phenomenon. Subsequently, the findings and discussions in light of prior research are presented. Key contributions, limitations and implications for further future research are presented in the conclusion.

2. LITERATURE REVIEW

CI research has focused primarily on how to gather information to make better decisions (Solberg, 2019). Researchers have concentrated on the CI process with little or no attention given to the cognitive psychological perspective of users. In most cases, the behavioural intention and use behaviour of mobile app users have been ignored. Previous research on CI was more concerned with web and desktop applications but the focus has rapidly shifted towards mobile applications due to a surge in the use of mobile applications and digitalization of global economies. Of current concern to researchers are issues surrounding big data, AI, IoT, 5G, algorithms, and cybersecurity. With the rise in data censorship, risk of mass surveillance, data theft through face recognition, and victimization, users of mobile applications are unlikely to engage in CI gathering behaviour without prior and preliminary consideration. The acceptance and use of mobile applications in CI have become more of a planned behaviour.

According to Singer and Friedman (2014), mobile applications have in many ways influenced the very definition of modern life. The two further argue that a functioning internet with freedom of speech and a good connection to social networks is a sign not just of modernity, but of civilization itself. However, recent developments in mobile applications have caused huge debates around data privacy,

and freedom of speech. Data censorship, removal of accounts of users, and removal of platforms from networks has caused an outcry by users who feel that their rights are being infringed. Examples include the case of Donald J. Trump, Parler, and Telegram to mention just but a few. These developments now have a serious bearing on the acceptance and use of mobile applications. Motivators and drivers of user behavioural intention and use behaviour are now shifted towards risk, security, privacy, and freedom of speech. For example, Telegram, surpassed 500 million active users on the 18th of January 2020 with more than 25 million new users from around the world joining the platform as a result of freedom and security issues in other platforms (for example, https://t.me/TelegramTips/233). Telegram argues that it stands for freedom and privacy and has many easy to use features (ibid). Researchers have attempted to explain the acceptance and use of mobile applications with varied outcomes that range from social influence, utilitarian gratification, hedonic gratification of affection and leisure, website social presence, reasons linked to cost, sense of community, unlocking new opportunities for intimate communication, addictive behaviours as well as data gathering (Ellison, Steinfield and Lampe, 2007; Java et al., 2007; Schneider et al., 2009; Brandtzæg and Heim, 2009; Xu et al., 2012; Church and de Oliveira, 2013; Cheung, 2014; Sultan, 2014; Pielot et al., 2014; Bouhnik and Deshen, 2014; Narula and Jindal, 2015; Karapanos, Teixeira and Gouveia, 2016; and So, 2016).

CI has played an important role in economic development and its factors (Maune, 2017). The objective of CI has been to understand how the surrounding competitive environment impacts an organization – by monitoring events, actors, trends, research breakthroughs, and so forth – to be able to make relevant strategic decisions (Degerstedt, 2015). Degerstedt (2015) argues that a major trend in the world today is the increasing competition in global and digitalized markets where the speed of change and innovation is becoming faster than ever before. CI helps provide a better understanding of the global world. However, to Søilen (2017), developments in new technology are also posing a serious threat to companies as today every individual is a potential spy. Corporate espionage has also become a big problem with its consequences still underestimated. The current information/knowledge generation has placed CI at the centre stage of economic growth (Maune, 2017). Previously, factors such as capital, labour and natural resources were traditionally considered as the only factors which matter for economic growth. However, the technology explosion of the 1990s primarily stimulated the notion of CI as being something entirely new or even revolutionary (Maune, 2014a). Maune (2014b) argues that the emergence of the internet and online databases have offered an almost inexhaustible supply of information that has caused information overload in many instances. This has resulted in the development of social competitive intelligence by intelligence practitioners (Maune, 2017).

2.1 Unified theory of acceptance and use of technology

According to Benbasat and Barki (2007) and Venkatesh et al. (2007), understanding individual acceptance and use of information technology is one of the most mature streams of information systems research. Several theoretical models were developed from psychology and sociology to explain technology acceptance and use (Venkatesh et al., 2003). A review and synthesis of eight theories/models of technology use by Venkatesh et al. (2003) resulted in the unified theory of acceptance and use of technology (UTAUT). To Venkatesh et al. (2003), UTAUT has distilled the critical factors and contingencies related to the

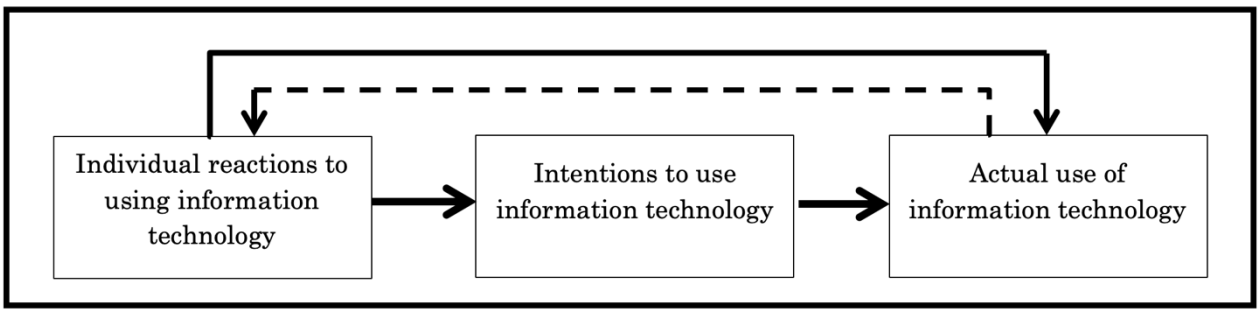

Figure 1 The basic concept underlying the user acceptance model. Adapted from Venkatesh et al. (2003).

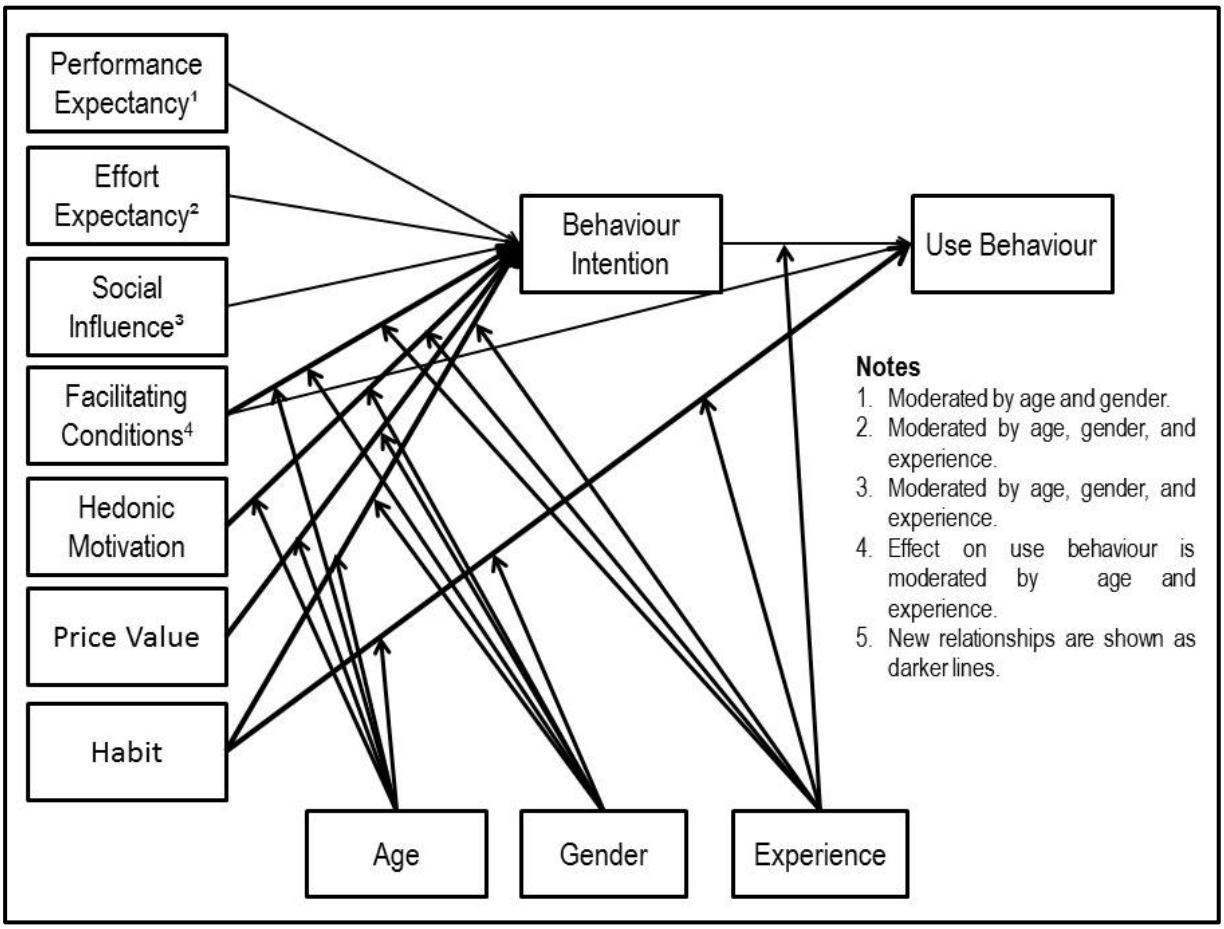

Figure 2 UTAUT2 Model. Adapted from Venkatesh et al. (2012).

prediction of behavioural intention to use technology primarily in organizational contexts. Figure 1 presents the basic conceptual framework underlying the class of models explaining individual acceptance of information technology that forms the basis of this research.

According to Venkatesh et al. (2012), Venkatesh et al. (2003) developed UTAUT as a comprehensive synthesis of prior technology acceptance research based on a review of the extant literature. UTAUT has four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) that influence behavioural intention to use a technology and/or technology use. Venkatesh et al. (2012) adapt these constructs and definitions from UTAUT to the consumer technology acceptance and use context.

Here, performance expectancy is defined as the degree to which using technology will provide benefits to consumers in performing certain activities. Effort expectancy is the degree of ease associated with consumers' use of technology, social influence is the extent to which consumers perceive that important others (for example, family and friends) believe they should use a particular technology, and facilitating conditions refer to consumers' perceptions of the resources and support available to perform a behaviour (Brown and Venkatesh, 2005; Venkatesh et al., 2003; and Venkatesh et al., 2012). According to UTAUT, performance expectancy, effort expectancy, and social influence are theorized to influence behavioural intention to use technology, while behavioural intention and facilitating conditions determine technology use. Also, individual difference variables, namely age, gender, and experience are theorized to moderate various UTAUT relationships (Figure 2).

Based on the gaps in UTAUT (Venkatesh et al., 2003) and the associated theoretical explanation provided, Venkatesh et al. (2012) integrate hedonic motivation, price value, and habit into UTAUT to tailor it to the consumer technology use context later known as UTAUT2 (Figure 2.). Brown and Venkatesh (2005) define hedonic motivation as the fun or pleasure derived from using technology, and it has been shown to play an important role in determining technology acceptance and use. Van der Heijden (2004) and Thong et al. (2006) find hedonic motivation (perceived enjoyment)

to influence technology acceptance and use directly. Brown and Venkatesh (2005) and Childers et al. (2001) also find hedonic motivation an important determinant of technology acceptance and use in the consumer context. Thus, Venkatesh et al. (2012) add hedonic motivation as a predictor of consumers' behavioural intention to use technology.

An important difference between a consumer use setting and the organizational use setting, where UTAUT was developed, is that consumers usually bear the monetary cost of such use whereas employees do not. The cost and pricing structure may have a significant impact on consumers' technology use. For instance, there is evidence that the popularity of short messaging services (SMS) in China is due to the low pricing of SMS relative to other types of mobile internet applications (Chan et al., 2008). Dodds et al. (1991), cited by Venkatesh et al. (2012), define price value as consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them. The price value is positive when the benefits of using technology are perceived to be greater than the monetary cost and such price value has a positive impact on intention (Venkatesh et al., 2012). Thus, Venkatesh et al. (2012) add price value as a predictor of behavioural intention to use technology.

Prior research on technology use has introduced two related yet distinct constructs, namely experience and habit. Experience, as conceptualized in prior research (Kim and Malhotra, 2005 and Venkatesh et al., 2003), reflects an opportunity to use a target technology and is typically operationalized as the passage of time from the initial use of technology by an individual. A habit has been defined as the extent to which people tend to perform behaviours automatically because of learning (Limayem et al., 2007), while Kim et al. (2005) equate habit with automaticity. Although conceptualized rather similarly, a habit has been operationalized in two distinct ways: first, habit is viewed as prior behaviour (Kim and Malhotra, 2005); and second, habit is measured as the extent to which an individual believes the behaviour to be automatic (Limayem et al., 2007). Consequently, there are at least two key distinctions between experience and habit. One distinction is that experience is a necessary but not sufficient condition for the formation of habit. A second distinction is that the passage of chronological time, that is, the experience can result in the formation of differing levels of habit depending on the extent of interaction and familiarity that is developed with a target technology.

2.2 Competitive intelligence

CI is variously presented as a process, a function, a product, or a mix of all three (Gilad and Gilad, 1985 cited by Bergeron and Hiller, 2002). Gračanin, Kalac, and Jovanović (2015) argue that there is no single and universal definition of CI and the most commonly used and cited definition was provided by the Society of Competitive Intelligence Professionals (SCIPs) where CI is defined as the process of monitoring the competitive environment. CI is defined as actionable recommendations arising from a systematic process involving planning, gathering, analysing and disseminating information on the external environment for opportunities, or developments that have the potential to affect a company's or country's competitive situation (Calof and Skinner, 1999). CI has become a strategic business tool that has long been proposed to increase companies' competitiveness (Montgomery and Urban, 1970; Pearce, 1976; Montgomery and Weinberg, 1979; Porter, 1980). CI enables managers in companies of all sizes to make decisions about everything, including marketing, research and development, investments and long-term business strategies. Following the arguments of many different authors cited by Pellissier and Nenzhelele (2013) in the 50 definitions of CI, one is forced to conclude that there is no universally agreed definition of CI although there are common characteristics in each, and there are also unique characteristics identified. CI should stimulate an organization's creativeness, innovativeness, and willingness to change (Bergeron and Hiller, 2002), in a continuing quest to create an evolving and intelligent organization. A more unified view of CI was recently provided by Madureira, Popovi˘c, and Castelli (2021) as "… the process and forward-looking practices used in producing knowledge about the competitive environment to improve organizational performance."

It is interesting to note how CI has developed over the years since the 1980s and 1990s when the founders Jan Herring, Leonard Fuld, and Ben Gilad built it. To Solberg (2019) CI now consists of an interesting body of literature, though it was not the first term to deal with questions of intelligence in private organizations, and it is not the last. Before CI

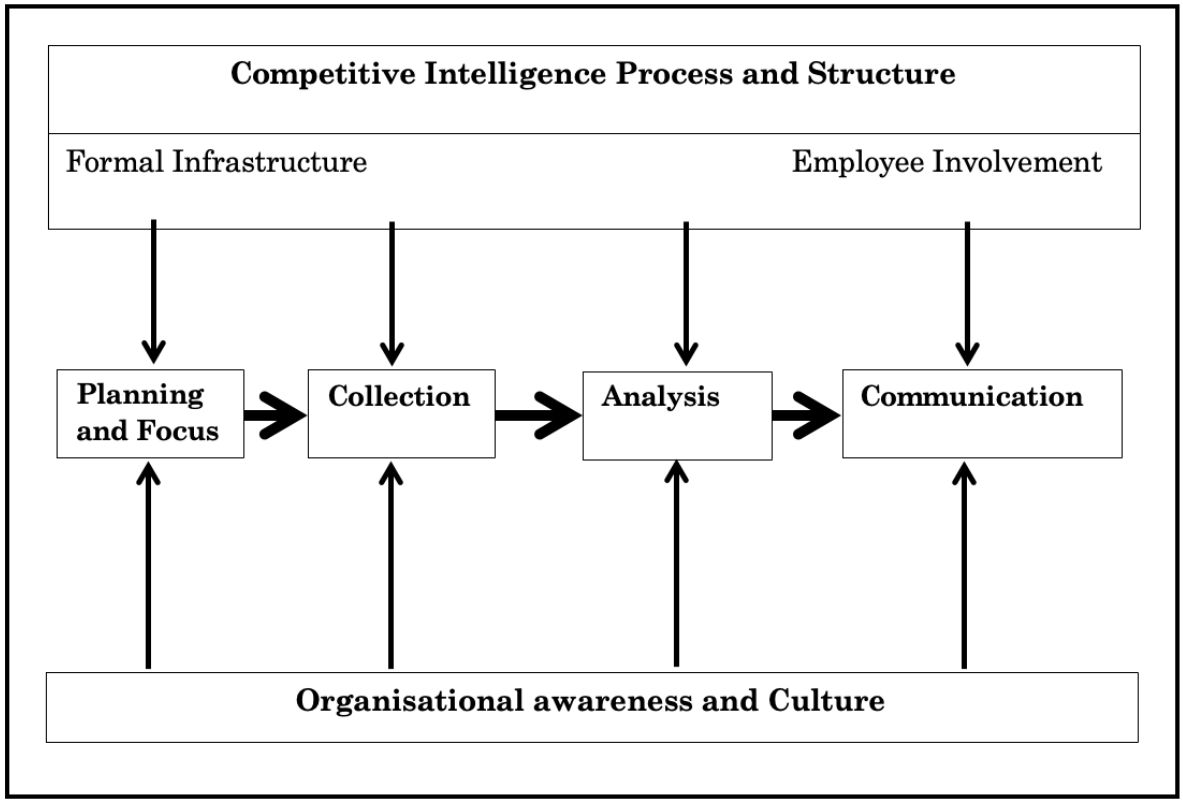

Figure 3 Competitive intelligence process. Adapted from Dishman and Calof (2007, pp. 779).

there was social intelligence, strategic intelligence and corporate intelligence, and now it includes terms such as market intelligence, marketing intelligence, business intelligence, collective intelligence, financial intelligence, scientific and technical intelligence, foresight, insight, and equivalent terms in other languages as well. Maune (2019) argues that with the advent of globalisation, a term that was introduced in the 1980s, the role of CI becomes more visible and is strengthened by the increase in competition among nations and organisations.

Calof and Skinner (1999) state that countries such as the USA, France, Sweden, Japan and Canada have recognized the value of government and industry working jointly in the development of an intelligence culture. According to the Strategic and Competitive Intelligence Professionals website (SCIPs), CI has spread to six continents with 53 international chapters distributed as follows; North America (28), Australia (1), Europe (10), Asia (8), Africa (3), and South America (3). SCIP now has overs 300 ambassadors, 280 certified professionals, and 480 thought leaders.

CI is both a process and a product (intelligence) (Bose, 2008). The process of CI is the action of gathering, analyzing, and applying information about products, competitors, suppliers, regulators, partners, and customers for the short- and long-term planning needs of an organization (Kahaner, 1998). The CI process is a continuous cycle. Even though the phases are shown in sequence, are all conducted concurrently. While available information is processed, additional information is collected, and the intelligence staff is planning and directing the collection effort to meet new demands. Previously collected and processed information (intelligence) is disseminated as soon as it is available or needed. Five phases constitute the CI cycle (Kahaner, 1998, and McGonagle and Vella, 2012). The first phase, planning and direction, defines the company's requirements in terms of what information is needed? Why is it needed? When is it due? The collection activities include identification of all potential sources of information and then research and gather the right data legally and ethically from all available sources and put it in an ordered form. The analysis – a crucial step – activities involve analyzing collected data to identify patterns, relationships, or anomalies in it. Dissemination – report and inform – is the finished product or the CI communicated back to the decision-makers in a format that is easily understood. Feedback – evaluate – is the final phase in the cycle. It involves measuring the

impact of the intelligence that was provided to the decision-makers.

These basic phases are linked to each other by a feedback loop (Kahaner, 1998, and McGonagle and Vella, 2012). Dishman and Calof (2007) argue that the CI process identified in the literature includes the constructs of planning and focus, collection, analysis, communication, process and structure, and organisational awareness and culture as given shown in Figure 3. Barnea (2013) traces the CI roots to national intelligence. Barnea (2013) argues that governmental decision-makers are aware that intelligence is an important and often critical tool to the national decision-making process. To him, CI is based on the "intelligence cycle". CI adopted the discipline of national intelligence and applies it to its needs, with necessary modifications.

According to Field Manual [FM] 34-3 (1990), CI operations follow a four-phase process known as the intelligence cycle. The intelligence cycle is oriented to the mission (FM 34-3, 1990); this can be for the country or organisation. The FM 34-3 (1990) reports that "supervising and planning are inherent in all phases of the cycle. The intelligence cycle is continuous. Even though the four phases are conducted in sequence, all are conducted concurrently. While available information is processed, additional information is collected, and the intelligence staff is planning and directing the collection effort to meet new demands. Previously collected and processed information (intelligence) is disseminated as soon as it is available or needed." Mobile apps are becoming critical in the CI process given their perceived mobility and the limited functionality of websites (Murphy, 2011). Table 1 shows some of the CI resources from social media platforms.

2.3 Determinants of mobile application use for competitive intelligence

Mobile applications are defined as software that can perform certain tasks for the users operating their mobile devices (Islam and Mazumder, 2011). Mobile applications differ from websites, as the user downloads them from the mobile application store, which is a database that allows the mobile user to discover and install available mobile applications (Wong, 2012).

Table 1 Competitive intelligence type and resources.

Competitive intelligence type	**Competitive intelligence resources**
People events	News, company websites, social media platforms such as Facebook, Twitter, Whatsapp etc.
Competitor strategies – technology investments etc.	News, discussion forums, blogs, patent search sites, social media platforms.
Consumer sentiments	Review sites, social networking sites, social media platforms such as Facebook, Twitter, Whatsapp etc.
Promotional events and pricing	Social media platforms such as Facebook, Twitter, Whatsapp etc.
Related real-world events	News, Social media platforms such as Facebook, Twitter, Whatsapp etc.

The surge in the uptake and use of mobile apps has helped many organisations and individuals in making decisions. Mobile applications have also played a very critical role in the CI process. Why mobile applications? Bulao (2021) and Vuleta (2021) state that Google, Facebook, Microsoft, and Amazon store at least 1,200 petabytes of information. Google handles a staggering 1.2 trillion searches every year. The two state that there were 71.5 billion apps downloaded worldwide in the first half of 2020. Google Play Store had 52.3 billion total downloaded apps during that period while the App Store had 18.3 billion. In 2020, roughly 306.4 billion emails were sent and received each day and in 2024, the number of emails will be about 361 billion every day (http://www.statista.com). Bulao (2021) states that experts predict that Google searches will amount to about 2 trillion in the whole of 2021. That equates to 6 billion searches a day.

In terms of connection, for example, over 2 billion minutes of voice and video calls are made on WhatsApp daily, and one billion people use this platform every day with more than two billion WhatsApp users in 180 countries as of 2020. Facebook had 1.82 billion daily active users and 2.7 billion monthly active users as of the 3rd quarter of 2020. Facebook generated four petabytes of data every day in 2020. The total number of Twitter users was 340 million as of October 2020 with 500 million tweets sent per day. These figures show how large these mobile applications are in terms of data repository. These numbers are

more likely to increase with the adoption of 5G technology. 5G has the ability to increase data transmission speed by up to 100 times and decrease latency from about 20 milliseconds to one millisecond (http://www.statista.com).

The UTAUT2 has been widely used to examine the acceptance and use of IT. For example through instant messengers, Web-based learning, cellphone application adoption, acceptance of network by urban people, use of electronic public service innovations, electronic booking solutions, academic settings, mobile banking adoption, mobile commerce, and mobile shopping (Lin and Anol, 2008; Chiu and Wang, 2008; Tan et al., 2010; and Yuen et al., 2010).

Kang (2014) argues that researchers such as Gefen and Straub (1997), King and He (2006), Schepers and Wetzels (2007), and Huang (2008) suggest that theoretical models of technology adoption and use encompass other important theoretical constructs such as motivations and functional aspects. In 2012 Venkatesh et al. developed the UTAUT2 that combines diffusion of innovation theory (DIT) (Rogers, 1962, 1995), theory of planned behaviour (TPB) (Ajzen, 1985; Fishbein and Ajzen, 1975), the technology acceptance model (TAM) (Davis, 1989), social cognitive theory (SCT) (Bandura, 1997), and unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) to encompasses functional and contextual factors to increase the explanatory power in the adoption and use of information technology. The UTAUT2 specifically uses several key variables that lead to the intention of use and actual use. Venkatesh et al. (2012) explain that performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit are factors influencing behavioural intention or use behaviour of IT.

Table 2 Behaviour intention measurement items and sources.

Latent Variable	**Measurement items**	**Source**
PE (***performance expectancy)***	PE1. I find mobile Apps useful in my daily life. PE2. Using mobile Apps increases my chances of achieving things that are important to me. PE3. Using mobile Apps helps me accomplish things more quickly. PE4. Using mobile Apps increases my productivity.	PE1-4 adapted and modified from "performance expectancy" in and Venkatesh et al. (2003) and Venkatesh et al. (2012).
EE (***effort expectancy)***	EE1. Learning how to use mobile Apps is easy for me. EE2. My interaction with mobile Apps is clear and understandable. EE3. I find mobile Apps easy to use. EE4. It is easy for me to become skillful at using mobile Apps.	EE1-4 adapted and modified from "effort expectancy" in and Venkatesh et al. (2003) and Venkatesh et al. (2012).
SI (***social influence)***	SI1. People who are important to me think that I should use mobile Apps. SI2. People who influence my behaviour think that I should use mobile Apps. SI3. People whose opinions that I value prefer that I use mobile Apps.	SI1-3 adapted and modified from "social influence" in Venkatesh et al. (2012) and Venkatesh et al. (2003) for SI1-2.
FC (***facilitating conditions)***	FC1. I have the resources necessary to use mobile Apps. FC2. I have the knowledge necessary to use mobile Apps. FC3. Mobile Apps are compatible with other technologies I use. FC4. I can get help from others when I have difficulties using mobile Apps.	FC1-4 adapted and modified from "facilitating conditions" in Venkatesh et al. (2003) and Venkatesh et al. (2012).
HM (***hedonic motivation)***	HM1. Using mobile Apps is fun. HM2. Using mobile Apps is enjoyable. HM3. Using mobile Apps is very entertaining.	HM1-3 adapted and modified from "hedonic motivation" in Venkatesh et al. (2012).
PV (***price value)***	PV1. Mobile Apps is reasonably priced. PV2. Mobile Apps is a good value for the money. PV3. At the current price, mobile Apps provide good value.	PV1-3 adapted and modified from "price value" in Venkatesh et al. (2012).
HT (***habit)***	HT1. The use of mobile apps has become a habit for me. HT2. I am addicted to using mobile Apps. HT3. I must use mobile Apps. HT4. Using mobile Apps has become natural to me.	HT1-4 adapted and modified from "habit" in Venkatesh et al. (2012).
BI (*behavioural intention)*	BI1. I intend to continue using mobile apps in the future. BI2. I will always try to use mobile apps in my daily life. BI3. I plan to continue to use mobile Apps frequently.	BI1-3 adapted and modified from "behavioural intention" in Venkatesh et al. (2003) and Venkatesh et al. (2012).
TT *(trust)*	Based on my previous experience in using mobile apps… **TT1.** I think they are honest. **TT2.** I think they are trustworthy. **TT3.** I think they provide good services to users. **TT4**. I think they care about their users and take their concerns seriously. **TT5.** I think they keep users' security and privacy in mind.	TT1-5 adapted and modified from "trust" in Groß (2015).

Research has shown that performance expectancy (Rogers, 1995; Venkatesh et al., 2003; Arya, 2011; Pynoo et al., 2011; and Venkatesh et al., 2012), effort expectancy (Davis et al., 1989; Bandura, 1997; Agarwal and Prasad, 1999; Venkatesh et al., 2003; Han et al., 2006; Gupta et al., 2008; Wang and Wang, 2010; Curtis et al., 2010; and Venkatesh et al., 2012), social influence (Ajzen, 1985; Moore and Benbasat, 1991; Venkatesh and Davis, 2000; Venkatesh et al., 2003; Yang, 2007; Kijsanayotin et al., 2009; Homburg et al., 2010; Chong et al., 2010; and Venkatesh et al., 2012), facilitating conditions (Venkatesh et al., 2003; Brown and Venkatesh, 2005; and Venkatesh et al. 2012, hedonic motivation (Childers et al., 2001; van der Heijden, 2004; Brown and Venkatesh, 2005; Thong et al., 2006; and Venkatesh et al., 2012), price value (Zeithaml 1988; Dodds et al., 1991; Chan et al., 2008; and Venkatesh et al. 2012), habit (Ouellette and Wood, 1998; Ajzen, 2002; Kim et al., 2005; Kim and Malhotra 2005; Limayem et al., 2007; Ajzen and Fishbein, 2005; and Venkatesh et al. 2012), and trust (Gefen, Karahanna and Straub, 2003; Luarn and Lin, 2005; Lin and Wang, 2005; Wei et al., 2009; Joubert and Van, 2013; Vasileiadis, 2014; and Groß, 2015) toward IT predicts behavioural intention and use behaviour (Figure 2 and Table 2). In other words, the individual intention to use the technology depends on whether the technology is perceived as useful, easy to use, suggested by important others, the needed resources to use the technology are present, the technology is fun to use, the price value of the technology, and if the users have a habit of using the technology.

3. METHODS

Data were collected from published peer-reviewed journal articles collected from electronic databases. A broad search strategy was used covering separate databases such as EBSCO, Emeralds, ProQuest, Sage, Sabinet, Taylor & Francis, and Google scholar. Articles on acceptance and use of IT, specifically those that focused on mobile applications, were selected. Also, articles that were based on the UTAUT and UTAUT2 by Venkatesh et al. (2003) and Venkatesh et al. (2012) respectively were targeted. The intention of reviewing these articles was to identify constructs that predict behavioural intention and behavioural use of mobile applications in CI.

Keywords such as, 'competitive intelligence,' 'business intelligence,' 'tactical intelligence,' 'market intelligence,' 'corporate intelligence,' 'competitor intelligence,' 'social competitive intelligence,' 'technological intelligence,' 'product intelligence,' 'mobile apps,' 'mobile applications,' 'UTAUT,' 'UTAUT2,' 'unified theory of acceptance and use of technology,' 'behavioural intention,' 'behavioural use,' and 'strategic intelligence' were used in search engines to find relevant articles. To ensure reliability, peer-reviewed journal articles were highly considered. The researcher skimmed through the text of the journal articles first, checking whether it was relevant for this research article. Reviewing data from existing journal articles was necessary to enhance the generalisability of the findings. The purpose of this review was to identify the motivation for acceptance and use of mobile apps in CI as a way of enhancing the understanding and appreciation of human behaviour in the use of mobile apps in CI. Criteria for inclusion of articles in the review also included that the articles must be written in English. For effectiveness, the author reviewed 21 articles (Appendix 1). Articles were strictly selected to achieve the desired objective. Appendix 1 presents the distribution and articles that were used for this study.

The researcher also brought in ideas from outside the traditionally defined field of CI and IT and integrated different approaches, lines of investigation, or theories that had no previous connections. The researcher`s purpose was not only descriptive but also critical. The researcher used literature not as an authority to be referred to, but as a useful but fallible source of ideas about developments in the acceptance and use of mobile apps in CI. The review was done to serve as the basis for understanding the causal or correlational patterns of interconnections across events, ideas, observations, concepts, constructs, knowledge, interpretations and other components of mobile app acceptance and use in CI.

3.1 Analysis

First, the survey items were checked for measurement properties and sources (Table 2) as given by Venkatesh et al. (2003), Venkatesh et al. (2012), and Groß (2015). The estimation or proposed model was informed by studies by Venkatesh et al. (2003), Venkatesh et al. (2012), and Groß (2015). This was followed by

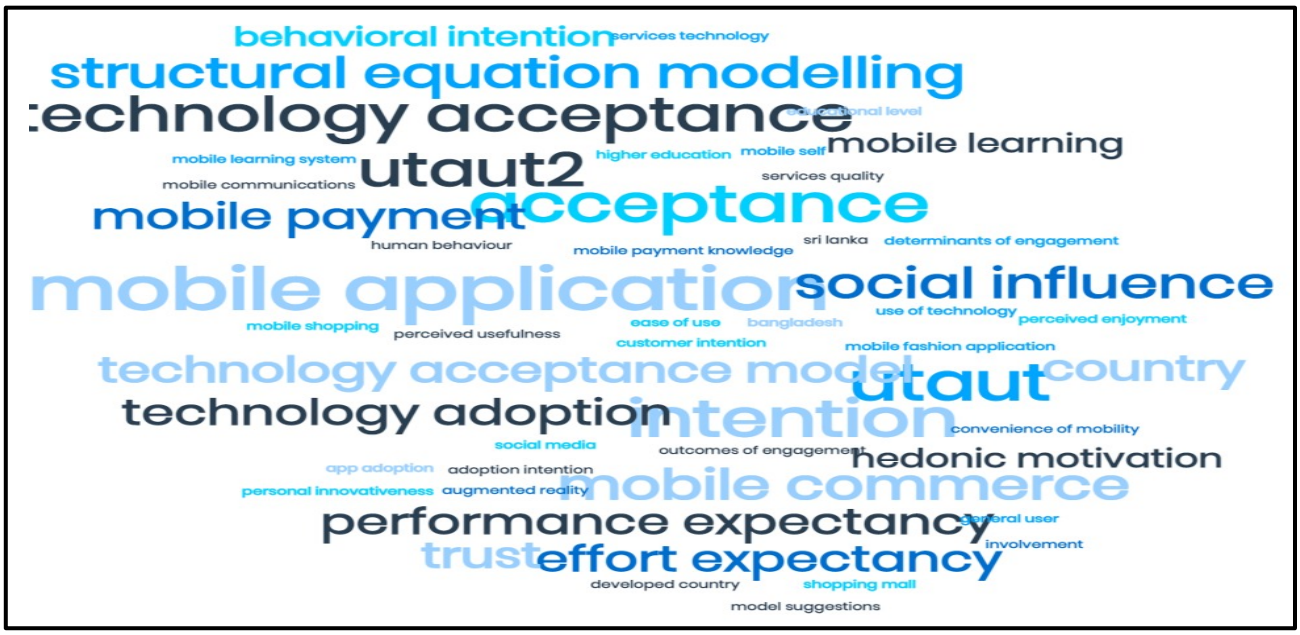

Figure 4 A visual representation of keywords.

a gathering of keywords and constructs used in the 21 reviewed journal articles. These words were analysed using the MonkeyLearn word cloud generator, a powerful AI visualization tool (Figures 4 and 5). This tool scores words for relevance as shown in Table 3 and Table 4. The researcher had to use his discretion to determine the cutoff of the ranking. The keywords and constructs generated from the word cloud and survey items, measurement properties and sources in Table 2 were used as a basis to formulate the proposed model of mobile applications intention of use and actual use in CI (Figure 6). The constructs used in the model were supported by the studies reviewed (Appendix 1). The researcher also found support from the following theories: TPB, TAM, UTAUT, and UTAUT2. The only missing construct or variable from all the reviewed articles was CI. No articles that integrated CI with mobile application acceptance and use from a cognitive psychological perspective were found. This promoted the development of an integrated model to cater to the cognitive perspective (Figure 6).

The CI construct is very important given the nature of the business environment that has become very dynamic and competitive, driven by developments in IT, AI, big data, algorithms, 5G, and cybersecurity. Decision making has become a challenge due to huge amounts of data availability. CI has become a relevant strategic business tool. As a result, CI has developed and emerged with IT to provide decision-making solutions over the years. Perceived usefulness, perceived ease of use and perceived enjoyment were omitted as these were perceived to be the same as performance expectancy, effort expectancy, and hedonic motivation, respectively (van Heijden, 2004 and Thong et al., 2006). To avoid confusion and duplication, these constructs were omitted even though they were presented as separate constructs in some of the reviewed journal articles. See Table 2 for specific details. In the end, the model in Figure 6 was proposed as the final model with 11 predictors of behavioural intention and use behaviour of mobile applications for CI.

Table 3 Rank, keywords and their relevance.

Rank	Keywords	Relevance
1	Mobile application	0.994
2	Structural equation modelling	0.745
3	Technology acceptance model	0.559
4	Mobile commerce	0.497
5	Social influence	0.497
6	Performance expectancy	0.373
7	Effort expectancy	0.373
8	Technology adoption	0.373
9	UTAUT	0.373
10	UTAUT2	0.311
11	Hedonic motivation	0.248
12	Mobile payment	0.248
13	Behavioural intention	0.248
14	Trust	0.186
15	Use of technology	0.186
16	Ease of use	0.186
17	Perceived usefulness	0.124

Figure 5 A visual representation of latent variables.

Table 4 Rank, latent variables and their relevance.

Rank	Latent variables	Relevance
1	Performance expectancy	0.997
2	Effort expectancy	0.935
3	Social influence	0.935
4	Behavioural intention	0.623
5	Hedonic motivation	0.498
6	Ease of use	0.467
7	Price value	0.436
8	Perceived usefulness	0.374
9	Perceived risk	0.249
10	Perceived enjoyment	0.187
11	Facilitating conditions	0.155
12	Habits	0.129
13	Subjective norm	0.125
14	Social efficacy	0.063
15	Trust	0.051

4. DISCUSSION

Appendix 2 presents the effects of selected predictors of behavioural intention and use in mobile applications. From the table, as developed from the 21 peer-reviewed journal articles, UTAUT2 predictors had a direct and significant influence on mobile application use with hedonic motivation, ease of use, and habits having 100% direct influence. Latent variables including hedonic motivation, effort expectancy, price value, habits, performance expectancy, social influence, and facilitating conditions have proved to be significant in influencing mobile application use and acceptance (Appendix 2). These are followed by ease of use, perceived usefulness, perceived enjoyment, and trust, though ease of use, perceived usefulness, and perceived enjoyment were omitted from the final proposed research model. As for perceived risk, Abrahão et al. (2016) and Khurana and Jain (2019) find it to have a direct and significant influence on mobile application behavioural intention and use while Liu and Tai (2016) and Chao (2019) find it insignificant, but due to recent developments in social media networks, perceived risk remains significant and having a direct influence on mobile applications user behavioural intentions. Subjective norms and self-efficacy have been found to exert significant influence on behavioural intention (Roy, 2017), but still Uğur and Turan (2019), Chao, (2019), and Tarhini et al. (2019) found them to have indirect insignificant influence. These two variables are borrowed from the Theory of Planned Behaviour developed by Ajzen (1991). These will be a good addition to the UTAUT2 model. Three moderating variables were identified with varying effects: gender, age, and experience (Kang, 2014, Palau-Saumell et al., 2019, and Nawaz and Mohamed, 2020). However, the role of moderators (gender, experience, and age) needs to be explored further in future research (Barua et al., 2018).

4.1 Implications for research

The conceptual framework of mobile applications behavioural intention and use in CI found in this study has serious future

research implications. To validate the proposed research model (Figure 6), a deductive research approach with a huge sample is required. This will help in the generalizability of findings with the potential of replication in different cultures, nations, age groups, and sectors. Such a model and its replication are critical for CI analysts and practitioners given the current mobile technology penetration as measured by its acceptance and use. Also, further studies catering for developed and developing countries as well as those looking at people with different income levels and age groups within the same society would be welcomed to understand the patterns and predictors of mobile application adoption and use in CI. These studies can then help with the replication of the model in different countries, cultures and sectors as well as shed further light on the generalizability of the findings. These findings will be critical for mobile application developers as well as users.

More so, such studies will help validate the explanations given regarding the insignificant influence of perceived risk, subjective norms, and self-efficacy on user behavioural intention and use of mobile applications. This presents an interesting opportunity for empirically validating these suggestions. Thus, researchers can evaluate different variable combinations to explore their relationships with behavioural intention. For example, research can combine TPB and UTAUT2 variables to predict their influence on behavioural intention and actual use. Research may also focus on mobile application security and privacy and their impact on behavioural intention and actual use of mobile applications in CI. Research needs to look at the best mobile application for CI practitioners and analysts.

Longitudinal and mixed methods research provides another important research paradigm in the area of mobile application user behavioural intention and actual use in CI given the dynamism in mobile technology and mobile platform user censorship, alienation and cancel culture.

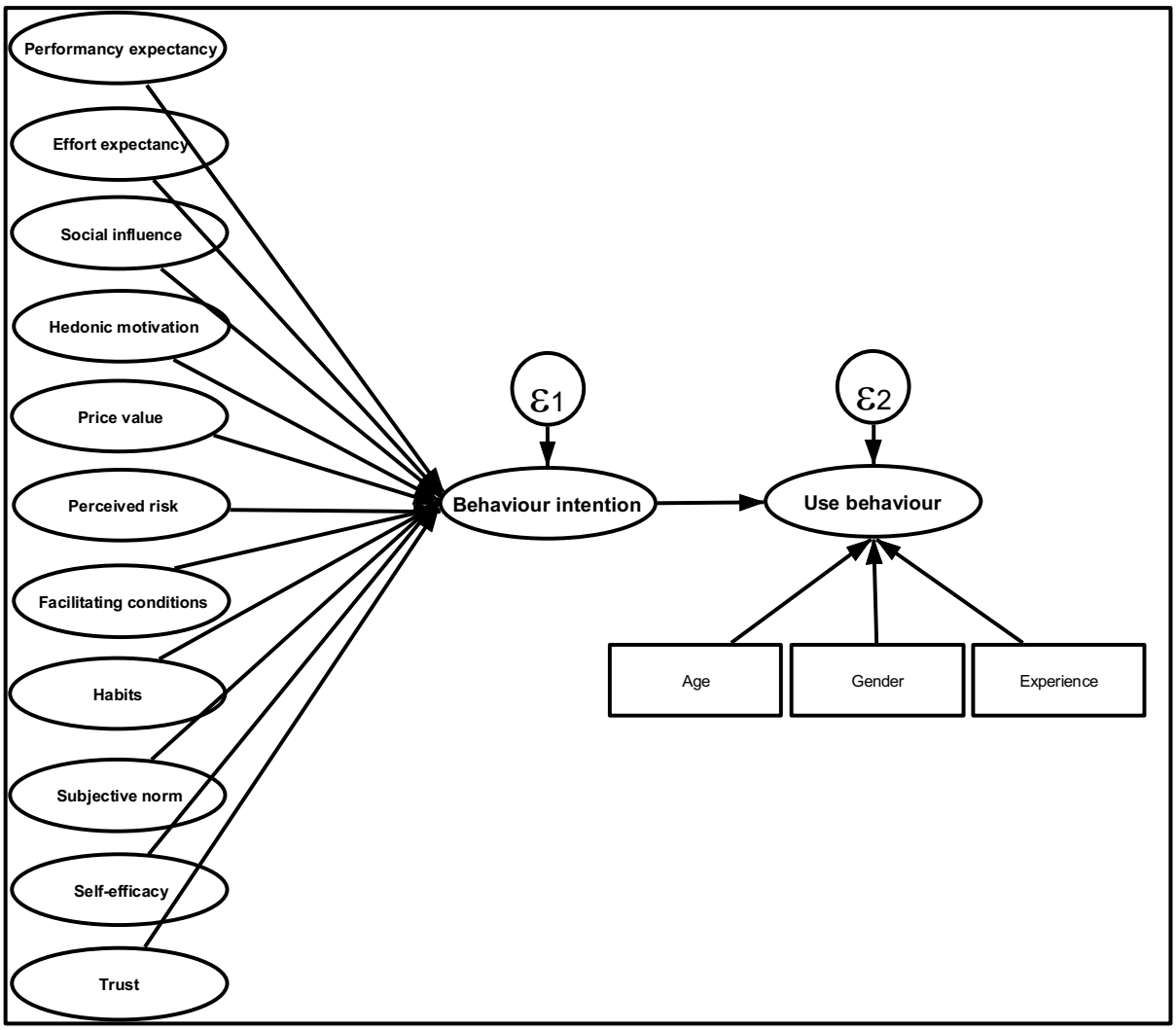

Figure 6 Proposed research model.

4.2 Implications for practice

The study developed a conceptual framework that is useful to mobile application developers and users alike. On one hand, developers will have a better understanding of users' needs and intentions in using their applications and on the other hand users (CI analysts, decision-makers, professionals) will make their needs and intentions fully known to developers. Given the issues surrounding privacy and cybersecurity risks associated with mobile applications, the study will be critical to policy formulation and implementation as well as regulation of mobile applications or technology companies. This study will go a long way in helping businesses develop competitive strategies through CI. The combination of different predictors of behavioural intention and the use of mobile applications in CI from different theories provides an in-depth understanding of this phenomenon. Particularly, UTAUT constructs turned out to have a well-established influence on acceptance and use of mobile applications. The current study therefore theoretically attempts to combine UTAUT2 constructs with other concepts or variables of cognitive behaviour to develop a robust conceptual framework that enhances the understanding of mobile application use in CI. This study contributes theoretically to the UTAUT2 model with particular emphasis on the role of cognitive behaviour in the use of mobile applications in CI.

Practically, there is no literature that has attempted to examine the relationship between UTAUT, mobile applications, and CI. This is still a grey area that requires more research, hence a follow-up is needed that will address this issue from an empirical point of view to establish the relationships that exists between constructs of UTAUT, mobile applications and CI. There is need to address the CI professionals as to the best mobile application to use. This entails ranking these mobile applications in terms of significance as a source of intelligence for decision making. An empirical survey will address this through involving experts and professionals both in mobile applications and CI. All these issues will be addressed in an empirical way as there is no current study that has addressed the issue. This has become more critical and urgent given the amount of big data created and stored by mobile applications on a daily basis as shown above. For CI professionals and analysts, mobile applications have become the biggest mines for intelligent data for decision-making. CI cannot avoid mobile applications and remain relevant given the amount of data that is created and stored by mobile applications. The predictions by Vuleta (2021) and Bulao (2021) that by 2030 nine out of every ten people aged six and above would be digitally active is just an example of how rapidly data production is growing each day. Predictors of behaviour are very critical for CI professionals and experts in this competitive environment as a result of technological developments. Understanding of behavioural intentions of users of technology has become more important than ever before. In this case research has shown that predictors such as performance expectancy, effort expectancy, social influence, ease of use, price value, perceived risk, and trust (see Tables 4 and 5) are important in determining one's behaviour in using mobile applications. This information is critical for players in CI and developers of mobile applications. What users need is more important than just imposing things on them.

4.3 Limitations

Several factors limited this study. A qualitative research approach was used based on a literature review of 21 published peer-reviewed articles which to some might be viewed as a small sample but to develop a conceptual framework the sample was adequate given the nature and timeframe of the study. According to Neuman (2014), doing an extensive professional summary review that covers all of the research literature on a broad question could take years for a skilled researcher. On the other hand, the same person could finish a narrowly focused review in a specialized area in a week. Nevertheless, as noted by Shneor and Munimb (2019), a bigger sample may strengthen the generalizability of the findings and illuminate the potential roles of contextual factors in shaping the phenomena under investigation. This study builds on Neuman's (2014) arguments that, "as in other areas of life, it is wise to find out what others have already learned about an issue before you address it on your own. Doing a literature review builds on the idea that knowledge accumulates, and that one can learn from and build on what others have done. The review rests on the principle that scientific research is a collective effort, one in which many researchers contribute and share results."

This approach, though subjective in nature, was critical in giving an in-depth

understanding and meaning of concepts under consideration. The articles used, however, were deemed trustworthy, authentic, and credible. This article forms an important base in analyzing the behavioural intention and use of the mobile application in CI. As stated by Creswell (2009), the intent of this study is not to generalize findings to individuals, sites, or places outside of those under study: the value of this study lies in the particular description and themes developed in the context of a specific site. Particularity, rather than generalizability (Creswell, 2009), is the hallmark of this study. The dynamics in mobile application technology also constrain the generalizability of the present findings. This study, however, forms a strong base for more robust quantitative studies based on surveys and structural equation models using advanced analytical software, such as SPSS, STATA, R, and Python. Prior limited research regarding behavioural intention and use of mobile applications in CI had a negative bearing on the review.

This study followed a mono-method approach which results in a certain level of method bias. Nonetheless, this was addressed by considering peer-reviewed published articles and reviewing different journal articles taken from different databases, countries, years and authors (Appendix 1).

The study could not, however, identify the CI construct in any of the analyzed articles. The final framework, therefore, presents a representation of the determinants of mobile application use. Literature has failed to show the link between these determinants for mobile application use for CI. This gap in the literature needs to be filled with an empirical study that connects the identified determinants in the model above to CI. A literature review was useful to unpack this phenomenon and identify the gaps in the literature.

5. CONCLUSION

Mobile applications are an important channel through which analysts, professionals, and businesses, as well as individuals, can gather CI for decision-making purposes. CI has become a global phenomenon in today's environment of intensifying global competition as a result of big data analytics, AI, IoT, 5G/6G, cybersecurity, as well as the adoption of mobile applications such as WhatsApp, Facebook, Instagram, and Telegram that have enabled high-speed availability and transfer of large amounts of data collected and accumulated by various individuals and organisations over the years. CI must not be confused with economic espionage which is unlawful and unethical: it is legal and is associated with a detailed code of ethics. The study has budded literature on CI and mobile application behavioural intention and use behaviour.

The study focused on developing a conceptual framework based on the understudied role played by cognitive antecedents in influencing behavioural intention and use of mobile applications in CI. The study showed the usability of the UTAUT2 model in the acceptance and use of mobile applications in CI. This culminated with the development of a conceptual framework with 11 predictors of behavioural intention and use of mobile applications in CI. The framework was developed from UTAUT, UTAUT2, TPB, and TAM. The articles that were reviewed made use of these theories in examining the predictors of behavioural intention and use of mobile applications. The missing element in all these studies was CI, which this study seeks to incorporate given its role in decision-making. The integration of UTAUT, UTAUT2, TPB and TAM with CI is critical considering the role of technology in the current business environment. To ensure reliability and credibility of the study, articles covering several countries such as Sri-Lanka, Jordan, Greece, Spain, India, Turkey, Taiwan, Korea, Oman, Bangladesh, Pakistan, Egypt, Malaysia, Germany, Vietnam, and Brazil from 2014 to 2020 were considered for this review.

A qualitative literature review of peer-reviewed journal articles was used to explore mobile application user behavioural intention and use to develop a conceptual framework that forms a base for a more robust deductive research approach. The study reviewed 21 journal articles to understand the role played by cognitive antecedents in behavioural intention. The results of this study will have a bearing on the use of mobile applications in CI. Articles were drawn from reputable academic databases such as EBSCO, Emeralds, ProQuest, Sage, Sabinet, Taylor & Francis, and Google Scholar.

The findings of this study support the generally accepted views regarding the factors influencing the acceptance and use of technology with minor variations and considerations. All UTAUT2 predictors of behavioural intention and use had a direct and significant influence on mobile application use

with hedonic motivation, ease of use, and habits having 100% direct influence (Appendix 2). Following in significance were ease of use, perceived usefulness, perceived enjoyment, and trust which were later dropped from the final proposed model, except for trust. However, perceived risk, subjective norms, and self-efficacy were insignificant in influencing behavioural intention and use of mobile applications (Roy, 2017; Uğur and Turan, 2019; Chao, 2019; Tarhini et al., 2019; Abrahão et al., 2016; Khurana and Jain, 2019; and Liu and Tai, 2016).

To summarize, this study presents several contributions. The study fills a gap in mobile application behavioural intention and use in CI though this needs to be validated using SEM, EFA and CFA. The proposed conceptual framework provides a theoretical base for the proposed model. This framework can be applied and tested in various contexts such as m-commerce, m-marketing, m-shopping, and m-banking. This model will go a long way in helping developers, analysts, policy-makers, regulators, and users of mobile applications understand the needs of each other.

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APPENDICES

Appendix 1. Articles reviewed by authors, title, purpose, methods, and keywords.

Author(s)	Title	Purpose	Context & nature	Method	Keywords
Nawaz and Mohamed (2020)	Acceptance of mobile learning by higher educational institutions in Sri Lanka: An UTAUT2 approach	The purpose of this study was to investigate the factors that might influence the intention and use behaviour of M-learning systems by students in higher education in Sri Lanka.	453 undergraduate and postgraduate students from Sri Lankan state universities.	Self-administering and Web-form questionnaire. The model was evaluated using CFA, EFA & SEM. Data were analysed using Microsoft excel 16, IBM's SPSS 22 and AMOS 22.	Structural Equation Modelling, UTAUT2, M-Learning Systems, Higher Education, Sri Lanka
Gharaibeh et al. (2020)	Exploring the intention to adopt mobile commerce: Integrating UTAUT2 with social media	To predict the determinants that influence consumer expectation and intention to adopt mobile	Jordan, Cross-sectional	Data was collected from 400 Jordanian consumers. Linear regression analysis.	Mobile commerce, UTAUT2, Social Media, customer intention, social influence, effort expectancy, hedonic

		commerce in Jordan.			motivation, performance expectancy, habit, facilitating conditions
Saprikis, Avlogiaris, and Katarachia (2020)	Determinants of the Intention to Adopt Mobile Augmented Reality Apps in Shopping Malls among University Students	The study aimed at making substantial suggestions and investigating an integrative theoretical paradigm that attempts to establish the significance of specific factors which allow using mobile augmented reality apps in shopping malls.	Greece – University students. Cross-sectional	2300 e-questionnaire sent, 405 responded & 381 retained. SEM, CFA & Maximum likelihood estimation.	augmented reality; adoption; UTAUT; mobile commerce; shopping mall
Palau-Saumell, Forgas-Coll, Sánchez-García, and Robres (2019)	User Acceptance of Mobile Apps for Restaurants: An Expanded and Extended UTAUT-2	The paper examines the adoption of mobile applications for restaurant searches and/or reservations (MARSR) by users, as part of their experiential quality.	Spanish who owned a smartphone and use MARSR applications. Cross-sectional.	An Online (netquest.com) questionnaire survey was sent to 1200 individuals. Data that was analyzed using structural equation modelling (SEM) – Maximum likelihood estimation procedure (EQS6.1) statistical software.	Mobile applications; technology adoption; UTAUT; perceived credibility; social influence.
Khurana and Jain (2019)	Applying and Extending UTAUT2 Model of Adoption of New Technology in the Context of M-Shopping Fashion Apps	To recognize the factors that affect the adoption of m-shopping fashion apps from the consumer perspective in Delhi NCR	Delhi-NCR, India. Cross-sectional	Structured online survey on the sample of 557 mobile app users aged 18-25. SPSS Amos – SEM & CFA used to analyse data.	Mobile Fashion Applications, Mobile Shopping, Utaut2, Technology Adoption, India
Uğur and Turan (2019)	Mobile Applications Acceptance: A Theoretical Model Proposal and Empirical Test	Investigating the factors influencing the behavioural intentions to use mobile apps and find out what makes some apps popular.	Turkey, State University. Cross-sectional.	Structured questionnaire to collect data from 1852 college students. SEM, PLS - SmartPLS Software.	Mobile Apps, Model Suggestion, Structural Equation Modeling (SEM), Technology Acceptance Model (TAM), Uses and Gratifications
Chao (2019)	Factors Determining the Behavioral Intention to Use Mobile Learning: An Application and Extension of the UTAUT Model	This study explored the behavioural intention to use m-learning from the perspective of consumers	Taiwan, Cross-sectional	A questionnaire sent to 2000 University students. Partial least squares (PLS) regression.	mobile learning, mobile self-efficacy, unified theory of acceptance and use of technology model, trust, perceived enjoyment, perceived risk
Jeon, Ali, and Lee (2019)	Determinants of consumers' intentions to	This study examines customers'	Korean, Cross-sectional	An invitation survey link to 4000 potential	Technology acceptance; UTAUT; innovativeness;

	use smartphones apps for flight ticket bookings	adoption and acceptance of smartphone apps to book their flight tickets.		respondents, 440 followed the invitation link, 381 respondents were retained, the final sample of 369 respondents. PLS-SEM-SmartPLS 3.0	involvement; trust
Tarhini et al. (2019)	An analysis of the factors affecting mobile commerce adoption in developing countries Towards an integrated model	This study aims to investigate the factors that may hinder or facilitate consumers' adoption of mobile-commerce in developing countries	Oman, Cross-sectional	530 questionnaires were distributed of which 432 were returned, of which 430 were retained. SEM & CFA -AMOS 21.0.	SERVQUAL, Developing countries, Structural equation modelling, Technology adoption, UTAUT, Mobile-commerce, Developed countries
Alam, Hu, and Barua (2018)	Using the UTAUT Model to Determine Factors Affecting Acceptance and Use of Mobile Health (mHealth) Services in Bangladesh	To identify the critical factors affecting the adoption of mHealth in the healthcare system by extending the UTAUT model to include perceived reliability and price value.	Dhaka city of Bangladesh, Cross-sectional.	Survey questionnaire to 323 participants from public and private hospitals. Smart PLS 2.0 was used to analyse data.	mHealth, UTAUT, general users, Developing Countries, Bangladesh
McLean (2018)	Examining the determents and outcomes of mobile app engagement- a longitudinal Perspective.	This research provides insight into the determinants and outcomes of consumer engagement with a retailer's m-commerce application.	longitudinal study	An online questionnaire to 689 consumers over 12 months and SEM - AMOS Graphics 24 (EFA, CFA).	Mobile applications, M-Commerce, Human behaviour, Determinants of engagement, Outcomes of engagement.
Sair & Danish (2018)	Effect of Performance Expectancy and Effort Expectancy on the Mobile Commerce Adoption Intention through Personal Innovativeness among Pakistani Consumers	To understand the relationships among performance expectancy, effort expectancy, personal innovativeness and behavioural intentions….	Pakistan, Cross-sectional	A questionnaire-based survey of 320. SEM-AMOS version 23.	M-commerce, performance expectancy, effort expectancy, personal innovativeness, behavioural intentions
Bendary & Al-Sahouly (2018)	Exploring the extension of the unified theory of acceptance and use of technology, UTAUT2, factors effect on perceived usefulness and ease of use on mobile commerce in Egypt	To examine the most relevant factors for mobile commerce adoption	Egypt, Cross-sectional	Questionnaire survey to 200 participants. SEM - AMOS Version 20	Convenience, Social influence, Hedonic motivations, perceived usefulness, ease of use.

Fadzil (2017)	A Study on Factors Affecting the Behavioral Intention to use Mobile Apps in Malaysia	To investigate the determinants of consumer behavioural intention (BI) to use mobile apps.	Undergraduate students at a Malaysian local university. Cross-sectional.	Survey questionnaire sent to 200 respondents. Regression analysis and equation modelling by using SPSS software	Consumer behavioural intention, Gender, Educational level, Malaysia, Mobile applications, UTAUT2
Ibrahim et al. (2017)	Descriptive Findings Regarding Factors Influencing Mobile Application Acceptance among Millennial in Malaysia	Factors influencing mobile application intention behaviour among millennial.	University students in Malaysia. Cross-sectional.	Survey questionnaire to 200 respondents. Descriptive analysis using frequency and scoring techniques.	Technology Acceptance, Mobile Application Use, UTAUT2
Kiat, Samadi, and Hakimian (2017)	Consumer Behaviour towards Acceptance of Mobile Marketing	To investigate the enabling factors that influence consumers' behaviour to accept mobile marketing	Malaysia, Cross-sectional	140 questionnaires designed in Google Forms sent to online respondents. SPSS – Pearson & multiple regressions.	-
Roy (2017)	App adoption and switching behaviour: Applying the extended TAM in smartphone app usage	The study examines (a) the adoption behaviour of mobile apps using the extended TAM framework and (b) whether adoption leads to subsequent use behaviour and switching intentions.	India – University. Cross-sectional	Target survey 600 and usable respondents 549. SEM, EFA, CFA, CV (maximum likelihood estimation – AMOS 20).	Mobile Applications (APPS); App Adoption; Switching Behavior; Extended TAM; Structural Equation Modeling
Schmitz, Bartsch, and Meyer (2016)	Mobile App Usage and Its Implications for Service Management – Empirical Findings from German Public Transport	To explain consumers' intentions to use mobile apps of service companies	Germany, Cross-sectional	An online survey using QuestBack's EFS to collect data from 197 app users of public transportation. focus groups of 18 people	mobile apps; self-service technologies; technology acceptance model; service quality
Liu and Tai (2016)	A Study of Factors Affecting the Intention to Use Mobile Payment Services in Vietnam	To spot out factors affecting the intention to use a mobile payment service plan	Vietnam, Cross-sectional	604 quantitative questionnaire, SPSS & AMOS software (SEM, EFA, CFA, & ANOVA).	The convenience of mobility, compatibility, M-payment knowledge, ease to use, usefulness, trust of safe to use, intention to use mobile payment, Vietnam
Abrahão, Moriguchi, and Andrade (2016)	Intention of adoption of mobile payment: An analysis in the light of the Unified Theory of Acceptance and Use of Technology (UTAUT).	To evaluate the intention of adopting a future mobile payment service from the perspective of current Brazilian consumers of mobile phones.	Brazil, Cross-sectional	30,000 emails were generated randomly and sent to Brazilian Telecom operator mobile phone users. 750 responses were collected, of which 605 were	Mobile payment; Innovation; Adoption intention; Acceptance and use of technology.

				validated. SEM - partial least squares (PLS), Smart PLS 3.0 software.	
Kang (2014)	Factors influencing the intention of mobile application use	The study examined factors that predict the use of intention of mobile applications.	Social networking sites	In an online survey, a total of 1513, 755 responses were used. SEM, MLP, AMOS 18.0	mobile communication; mobile applications; performance expectancy; effort expectancy; social influence; motivations; use intention.

Appendix 2. Effect of latent variables on behaviour.

Latent variable	**Influence on behaviour**	
	Direct/significant	**Indirect/No significant**
Performance expectancy	Nawaz and Mohamed (2020), Barua et al. (2018), Saprikis et al. (2020), Palau-Saumell et al. (2019), Fadzil (2017), Khurana and Jain (2019), Ibrahim et al. (2017), Gharaibeh et al. (2020), Hakimian et al. (2017), Chao (2019), Sair & Danish (2018), Jeon et al. (2019), Abrahão et al. (2016), Tarhini et al. (2019).	Uğur and Turan (2019), Kang (2014).
Effort expectancy	Palau-Saumell et al. (2019), Nawaz and Mohamed (2020), Barua et al. (2018), Fadzil (2017), Ibrahim et al. (2017), Gharaibeh et al. (2020), Hakimian et al. (2017), Chao (2019), Sair & Danish (2018), Abrahão et al. (2016), Kang (2014).	Tarhini et al. (2019), Khurana and Jain (2019).
Social influence	Palau-Saumell et al. (2019), Nawaz and Mohamed (2020), Barua et al. (2018), Fadzil (2017), Ibrahim et al. (2017), Gharaibeh et al. (2020), Abrahão et al. (2016), Bendary & Al-Sahouly (2018).	Tarhini et al. (2019), Khurana and Jain (2019), Saprikis et al. (2020), Kang (2014), Hakimian et al. (2017).
Hedonic motivation	Palau-Saumell et al. (2019), Nawaz and Mohamed (2020), Fadzil (2017), Khurana and Jain (2019), Ibrahim et al. (2017), Gharaibeh et al. (2020), Tarhini et al. (2019), Bendary & Al-Sahouly (2018).	-
Ease of use	McLean (2018), Roy (2017), Schmitz et al. (2016), Liu and Tai (2016).	-
Price value	Palau-Saumell et al. (2019), Fadzil (2017), Khurana and Jain (2019), Ibrahim et al. (2017), Tarhini et al. (2019).	Gharaibeh et al. (2020), Barua et al. (2018).
Perceived usefulness	McLean (2018), Roy (2017), Schmitz et al. (2016), Liu and Tai (2016).	Uğur and Turan (2019).
Perceived risk	Abrahão et al. (2016), Khurana and Jain (2019).	Liu and Tai (2016), Chao (2019).
Perceived enjoyment	Roy (2017), Chao (2019), Saprikis et al. (2020).	McLean (2018).
Facilitating conditions	Palau-Saumell et al. (2019), Nawaz and Mohamed (2020), Barua et al. (2018), Fadzil (2017), Ibrahim et al. (2017), Gharaibeh et al. (2020), Khurana and Jain (2019), Jeon et al. (2019), Tarhini et al. (2019).	Saprikis et al. (2020), Hakimian et al. (2017).
Habits	Nawaz and Mohamed (2020), Palau-Saumell et al. (2019), Fadzil (2017), Khurana and Jain (2019), Ibrahim et al. (2017), Gharaibeh et al. (2020), Tarhini et al. (2019).	-
Subjective norm	Roy (2017).	Uğur and Turan (2019).
Self-efficacy	Roy (2017).	Chao (2019), Tarhini et al. (2019).
Trust	Liu and Tai (2016), Chao (2019), Tarhini et al. (2019), Jeon et al. (2019).	Saprikis et al. (2020).

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The first wave impact of the COVID-19 pandemic on the Nasdaq Helsinki stock exchange: Weak signal detection with managerial implications

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ABSTRACT The global pandemic caused by the coronavirus disease (COVID-19) came mostly as a surprise and had a major effect on the global economy. This type of major events that can bring societies to nearly a total standstill are difficult to predict but have a significant impact on business activities. Nevertheless, weak signals might be possible to detect beforehand to enable preparation for the impact, both globally and locally. This study analyses the impact of the first wave of the COVID-19 pandemic on the Nasdaq Helsinki stock exchange by utilising large-scale media analytics. This entails gaining data through media monitoring over the entire duration of the pandemic by applying black-box algorithms and advanced analytics on real cases. The data analysis is carried out to understand the impact of a such global event in general, while aiming to learn from the potential weak signals to enable future market intelligence to prepare for similar events. A social media firestorm scale, similar to the Richter scale for earthquakes or Sapphir-Simpson scale for hurricanes, is utilised to support the analysis and assist in explaining the phenomenon. The results indicate that pandemics and their impact on markets can be studied as a subset of a media firestorms that produce a shark-fin type of pattern in analytics. The findings indicate that early signals from such events are possible to detect by means of media monitoring, and that the stock exchange behaviour is affected. The implications include highlighting the importance of weak signal detection from abundant data to have the possibility to instigate preventive actions and prepare for such events to avoid maximum negative business impact. The early reaction to this type of events requires a very streamlined connection between market intelligence and different business activities.

KEYWORDS Covid-19, early signals, Nasdaq Helsinki, signal detection, social media

1. INTRODUCTION

The contagious coronavirus disease (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first identified in Wuhan, China in December 2019 caused a large global outbreak and major public health issue (Lu et al., 2020). The World Health Organization (WHO) declared COVID-19 a pandemic on 11 March 2020 (Ferrer, 2020). These types of rare and unpredictable outlier events, which can have extreme impacts, resemble the black swan events (Taleb, 2007): phenomena with almost zero beforehand predictivity and a large global influence.

Analysing the impacts of the pandemic can prove lucrative as the COVID-19 coronavirus pandemic resulted in global lockdowns, sharply curtailing economic activity, while representing a unique experiment with substantial impacts. In the northern Europe, in Finland, the Nasdaq Helsinki stock exchange companies were also hit by COVID-19, the

pandemic influencing the valuation of most listed companies. Studies covering the impact of the pandemic on the stock markets have started to emerge. However, the previous research is yet to present a more detailed timeline of the events and to cover and discover possible early warning signals of the event. Specifically, large-scale media analytics over the period have not been applied for the purpose.

This study analyses the impact of pandemic events on the Nasdaq Helsinki stock exchange (OMHX). The pandemic caused by the coronavirus disease and the course of events are analysed by the means of large-scale media analysis, covering the events from the very first stages for a period of more than a year and a half. The impact of COVID-19 is attempted to be understood in general, in terms of the media coverage and the simultaneous events in the stock exchange. The analysis consists of machine-learning based large-scale media analytics to cover a vast pool of media. Instead of a before-and-after approach on the impact on the stock exchange, a higher-level general event influence analysis is carried out. Specific focus is on the influence of the first wave of COVID-19 by dividing it to stages (Figure 1).

This paper is organised as follows: a brief literature survey is provided in section 2, followed by the detailed description of the research method in section 3, followed by the impact analysis of the corona pandemic in section 4. The discussion in section 5 further addresses the experienced phenomenon in the context of the study and discusses the relevant implications. Finally, the paper is concluded.

2. LITERATURE REVIEW

The coronavirus created a global, national, societal, regional, political, economic and commercial crisis, which can be characterised as a disruptive period of instability, uncertainty, and danger, but at the same time, a period of accelerated diffusion of digital technologies and initiatives (Karabag, 2020). This type of crisis influences risk management and decision-making under uncertainty (Aven, 2013). The impacts of the COVID-19 coronavirus pandemic include short-term decreases in emissions, consequences on the deployment of macroeconomic monetary and fiscal stimuli, investments in green deals, and possible further deglobalisation (Helm, 2020), impacts on travel and tourism (Li et al., 2020), and mandatory closures and reopening of businesses (Walmsley et al., 2021).

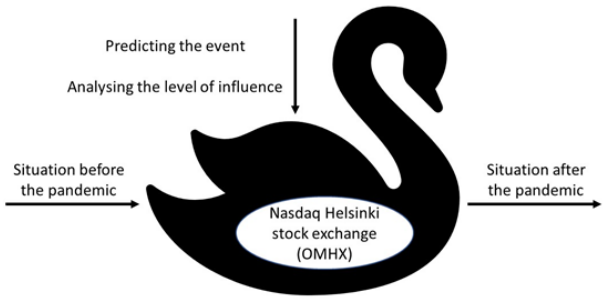

Figure 1 The research setting.

The influence of market reactions to unanticipated, catastrophic events, has been studied for example in the case of the 9/11 terrorist attacks in the USA (Carter & Simkins, 2004), and in the case of war (Schneider & Troeger, 2006). Generally, in case of any unexpected news, the markets tend to over-react and as more information becomes available and people understand the influences, the market seems to correct itself (Phan & Narayan, 2020). Concerning the stock markets, the consumer industry in the Chinese stock market was transitorily impacted by the pandemic in the first three trading days following the start of the pandemic (Yan & Qian, 2020). Significant negative effects on Chinese stock returns were observed across all companies (Al-Awadhi et al., 2020). Also, in Africa, stock markets reduced significantly during and after the start of the COVID-19 pandemic, usually between -2.7 % and -20 %, while the effects were restrictive (Takyi & Bentum-Ennin, 2021). In the USA, the initial impact on the stock market was in the same ballpark as the Great Crash of 1929, the Great Depression Crash of 1933, and the Black Monday Crash of 1987 (Contessi & De Pace, 2021). In Europe, the stock markets also showed volatility, some markets being more volatile than others (Aslam et al., 2021). The impact of pandemics on macroeconomic performance has aroused research attention, while many studies have attempted to explore the effect on the financial markets. These studies indicate the large economic cost of pandemics (Elnahas et al., 2018, Bloom et al., 2018). Table 1 lists further studies that have a focus on COVID-19 and the related impacts.

When starting to investigate the influence of any unanticipated significant crisis, explanations can be sought by looking at black swan events as defined by Taleb (2007), or other relevant concepts such as emerging risk. Emerging risk can be considered meaningful and complementary by relating it to known unknowns and black swans to unknown knowns, unknown unknowns, and a subset of

known knowns (Flage & Aven, 2015). The unknown unknowns that involve the lack of awareness, in practice or in principle, are also referred to as black swans by Taleb (2007) and have been linked to seeking for patterns to reveal risks (Leidner & Schilder, 2010). The research on Black Swan events in general can be divided into three different stages – pre-black swan event, about the black swan event, and post-black swan event (Parameswar *et al.,* 2021). Social media monitoring, despite its challenges, provides means for the market intelligence function to discover similar events (Töllinen *et al.,* 2012).

Table 1 Studies focusing on the impacts of COVID-19.

Focus	**Methodology**	**Reference**
March 2020 stock market crash triggered by COVID-19. S&P1500 evidence.	Event-study methodology	(Mazur et al. 2021)
COVID-19 generated negative shocks on the equity markets.	Event-study method	(Harjoto et al., 2021)
The impact of the COVID-19 pandemic on the stock market crash risk in China.	Estimating conditional skewness	(Liu et al., 2021)
How trust affects global stock market volatility during COVID-19.	Market volatility assessment	(Engelhardt et al., 2021)
COVID-19 outbreak and stock market reactions in Australia & impact of a stimulus package.	Negative events assessment. Event-study methodology	(Rahman et al., 2021)
COVID-19 pandemic and global stock market volatility.	EGARCH (1,1) model	(Uddin et al., 2021)
The influence of government policy responses to the COVID-19 pandemic.	Estimation methods including a random-effects model	(Zaremba et al. 2021)
Collapses in the stock markets of 18 major countries during the first wave of the COVID-19 pandemic	Indices and mild explosiveness	(Contessi & De Pace, 2021)
The impact of COVID-19 on stock market volatility between the U.S. and China.	Quantile-on-quantile (QQ) method	(Gao et al., 2021)
Time-frequency relationship between the recent COVID-19 pandemic and instabilities in oil price and the stock market.	Wavelet method	(Chien et al., 2021)
The effect of the governments' responses to fighting the COVID-19 pandemic on the returns in the stock market index.	difference generalized method of moments (DGMM)	(Chang et al., 2021)
Comparative assessment of the impacts of the COVID-19 pandemic on the US stock market.	multivariate GARCH, restricted correlation models, DCC and ADCC	(Yousfi et al., 2021)
The impact of economic policy uncertainty (EPU) on the crash risk of the US stock market during the COVID-19 pandemic.	Gram–Charlier series expansion method	(Dai et al., 2021)
Potential explanations for the unprecedented stock market reaction to the COVID-19 pandemic.	Text-based methods	(Baker et al., 2020)
Stock price reactions to different stages in COVID-19's evolution.	Hypothesis	(Phan & Narayan, 2020)
Twitter affecting stock market decisions during the COVID-19 pandemic.	Financial sentiment analysis of influential Twitter accounts	(Valle-Cruz et al., 2021)
The initial impact of COVID-19 sentiment on the US stock market.	Correlation between COVID-19 sentiment and 11 select sector indices of the Unites States (US) stock market	(Lee 2020)
The impact of the outbreak on Bitcoin.	VADER scoring	(Pano et al., 2020)
Understanding the dynamics of public responses to events under uncertainty.	fusion of four deep learning	(Basiri et al., 2021)
Analysis of tweets by President Donald Trump during the early spread of the Covid-19 pandemic across the United States.	WADER, a rule-based model	(Yaqub. 2020)
Shifting sentiments during the COVID-19 pandemic.	Machine learning classification on deep learning language models	(Zhang et al., 2021)

The large data-set approach has been applied on emerging topics in the field of competitive/market intelligence that have discussed technological innovation focused for example on the competitive intelligence process (Casarotto *et al.,* 2021). However, the large-scale media analysis has not been, to a large extent, applied before to analyse the impact of pandemics, or to detect early warning signals to help in speeding up managerial actions in companies. Recent future studies claim that COVID-19 would not be a black swan, as a black swan event is defined as being unpredictable, a total surprise, and that the emergence of another coronavirus was predicted by many working in the emerging infectious diseases (EID) field (Inayatullah, 2020). Hence the argument in this case would be that if there is a weak signal, the phenomenon could not be called a black swan. This has an interesting link to the market intelligence function, and it can cause some debate on how to categorise different events. The identification of weak signals is considered a method to identify strategic surprises in a firm's environment, while implementing information technology in collection and treatment of the weak signals (Lescab, 2019).

Also, predictive analytics is discussed in the context of market intelligence. The predictive analytics enable informed decisions through a blend of data, analysis, and scientific reasoning (Nettleton, 2014). Attempts have been made to predict future behaviours by finding patterns in the data through various algorithms (Larson & Chang, 2016). The data processing, analytical technologies, business centric practices, and methods of business intelligence can also be applied on market intelligence (Shmueli & Koppius, 2011). Specifically, the predictive analytics and social media analysis provide an opportunity to gain first-hand market intelligence applicable to various areas (Jeble *et al.,* 2016). The analytics can involve descriptive analytics that entail activities of summarising historical performance to predictive analytics involving estimating potential future events and assessing possible actions to optimise business outcomes (Apte *et al.,* 2012). High impact applications are possible in market intelligence through social media monitoring and analytics via sentiment and effect analysis (Chen *et al.,* 2012). Nevertheless, regardless of the evident potential, ensuring the generation, dissemination, and responsiveness to modern market intelligence remains an ongoing challenge, necessitating further research (Romero *et al.,* 2021). Advanced predictive analytics is necessary to find weak signals or early warnings of significant events.

3. RESEARCH METHOD

The approach used in this study applies media monitoring with black-box software, including machine learning-based opinion mining on a vast pool of media that covers billions of online documents, including editorial and social media (SoMe). The vast pool of media includes all the data from over 3 million SoMe, and over 100,000 news and other media sources. Both free access and subscription-based media are monitored by utilising computer software to collect data. The media coverage of the corona epidemic was monitored and analysed for a period of more than a year and a half on a keyword basis, starting from the very first stages of the appearance of COVID-19. The on-going keyword searches were applied to a large dataset available through a media monitoring software, mined by black-box algorithms. The keywords used included "corona virus" and "COVID-19".

The global searches were intentionally limited to Finland, and the Finnish language, to save computational resources due to the enormous number of relevant data points existing globally. The total number of identified relevant data points with the defined limitations through the computer assisted media monitoring were 569,997 at the time of extracting the data for the analysis. The data include all the pandemic related media coverage in Finland during the focus period. This first step of the research of collecting the data on the entire media coverage of COVID-19 in Finland was carried out with the help of a commercial black box media monitoring software M-Adaptive (Nuortimo, 2021).

The exact digital algorithms on how the software operates are not known to the researchers, but the data was collected reliably by the software making automated relevance judgements on the data points available through the pool of media accurately, the same way every time. Specific relevant events in the media were harvested based on the requirements by the researchers. These relevant events in the media formed the attention timeline for the pandemic. The magnitude of the media attention is revealed

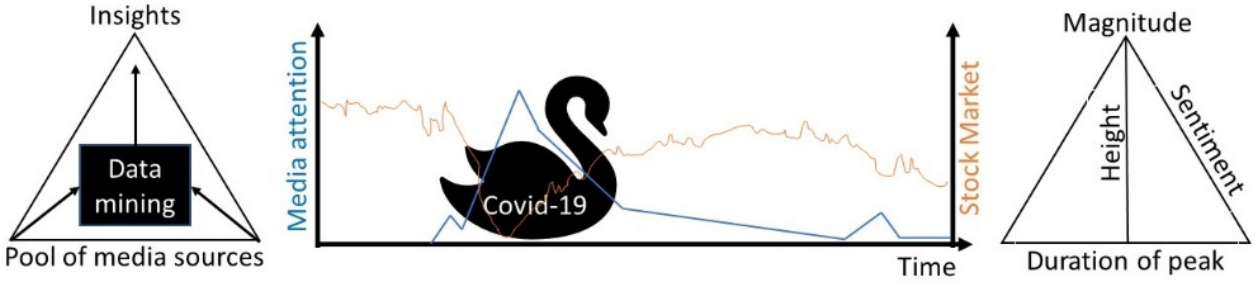

Figure 2 Research process.

both in SoMe and the published media. The computer-based media monitoring software used (M-Brain, 2015) has different lexicons (corpus) for several languages, including Finnish, which is the main language used in the data analysis in this study. The algorithms used by the software first calculated the local sentiments for each identified event by comparing the media event to the search terms, whereas the results were presented for the entire event by indicating the sentiment (neutral, negative, positive, mixed, or unknown sentiment). The sentiment classification accuracy was about 80% at most. Noteworthy is that human classification is not 100% accurate either and is dependent on the individuals carrying out the analysis. Human based classification is typically not fully consistent among different individuals and is limited to a small number of data points, limiting the possibilities of analysis.

The benefit of an algorithm-based analysis is that the computer does the analysis consistently, the same way each time, and can deal with a vast amount of data. The opinion mined sentiments are grouped and compared. The black box software approach has limitations by it providing limited benefits in terms of mainly detecting larger influences. Further application of the gained data was necessary. Hence a more thorough validation through comparison against findings with a similar software, or by human, might prove beneficial. The pandemic related media coverage was plotted on a timeline to reveal the magnitude of media attention during its course and reveal the main spikes in attention.

In the second step the data on the Nasdaq Helsinki stock exchange (OMHX) behaviour was obtained from Kauppalehti (Finnish multichannel news outlet focusing on economic phenomena and the money market) and the percent change was plotted on the same timeline as COVID-19 media attention to enable comparison and reveal how the stock exchange was being affected. The direct causality was not tested but was assumed. Specifically, the spikes in media attention were compared to the changes in OMHX behaviour to analyse whether any weak signals appear through the media that might be beneficial for future market intelligence to enable learning and avoid the maximum impact of unexpected events of this nature.

In the third step, the magnitude of media attention on such unexpected events was put into context to enable estimating the significance of spikes in the media attention and the event classification was attempted. A SoMe firestorm scale (Nuortimo et al., 2020), similar to the Richter scale for earthquakes or Sapphir-Simpson scale for hurricanes, was utilised to analyse the spikes in the media attention, and assist in explaining the phenomenon, and possibly enable estimating the impacts of potential risks.

In the fourth step, selected media hits appearing during the times of early spikes of the media attention were investigated to further analyse the possibilities of recognising early signals of events leading to the realisation of major risks. Finally, the analysis results were used to distil implications for future market intelligence, and implications for managers dealing with risks that relate to several issues, such as crisis communication and stock market behaviour. The research process is illustrated in Figure 2.

4. CORONA PANDEMIC IMPACT ANALYSIS

The impact of the coronavirus pandemic on the Nasdaq Helsinki stock exchange was analysed by plotting the media hits over an extended time period to visualise the development of the media attention on COVID-19. The development of the Nasdaq Helsinki stock exchange was plotted on the same timeline to enable the analyses. The analysis indicates that early stages of the COVID-19 pandemic, the first wave between 3/2020-6/2020 can be

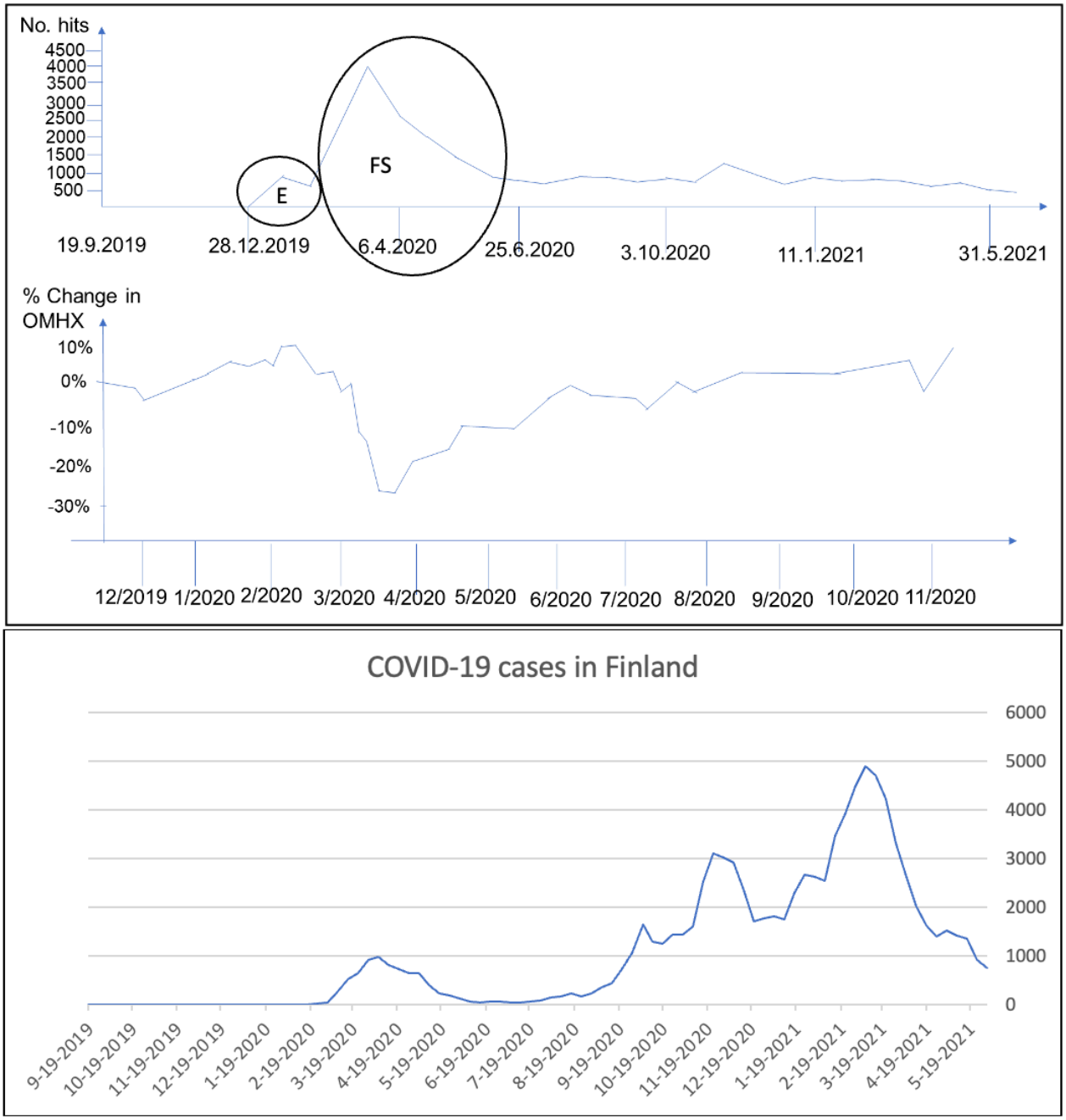

Figure 3 Finnish coronavirus related media hits/OMHX stock exchange behaviour and actual cases of COVID-19.

considered a media firestorm due to its shark-fin shape in the media analysis and the type of strong influence (Figure 2). However, when comparing to a traditional scandal-based media firestorm, COVID-19 and the related media communication are not focused on a single person or company. Instead, it has a large fundamental influence of a black swan type of phenomenon with crisis type effects (Figure 3). The actual Covid-19 cases are included in the illustration to enable comparison to the real situation.

The main spike of the COVID-19 related media hits (marked FS in Figure 3) and the linkage to the change in the Finnish stock index is clear. This period of high media attention fits the time-period when the OMHX stock index collapsed approximately 30%. The media spike is almost exactly in line with the stock index development during the largest peak. The stock exchange recovery began almost immediately after the initial hit. The deepest drop in share prices occurred between 17.2-10.3.2020, while weak signalling from the coronavirus situation in China to the Finnish market started to evolve earlier in the beginning of the year. Noteworthy is that the first true Finnish case of COVID-19 was discovered on January 27th, 2020, and the daily cases started appearing from February 10th onwards. This link to the reality in Finland may have affected the stock exchange drop.

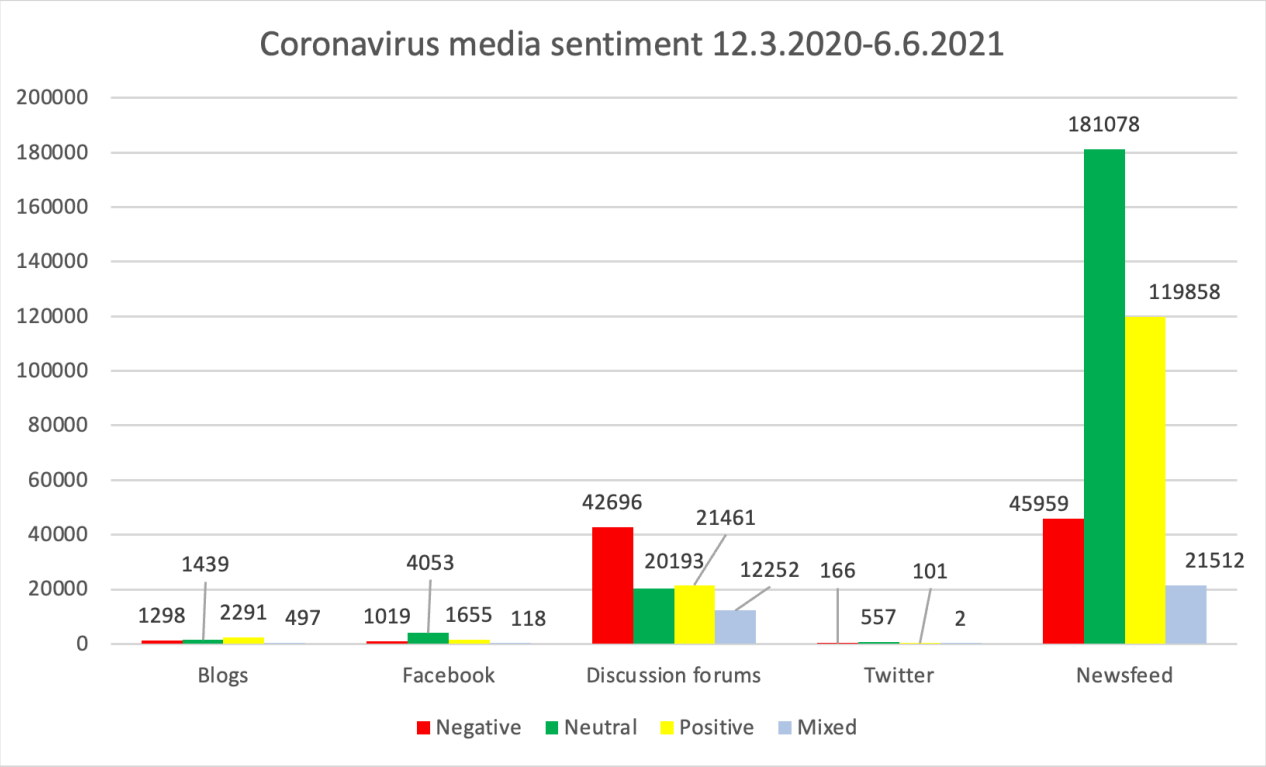

Figure 4 Media sentiment related to COVID-19 pandemic.

Concerning the market intelligence function in companies, the small media spike (marked E in Figure 3) in 28.12.2019-1/2020 can be considered an early warning or weak signal to the Finnish stock exchange that could have been derived from the news about China's situation. The same signal can be present also in different types of media firestorms, for example those involving SoMe and scandals (Nuortimo, 2020). The early warning signals are studied for example in the competitive intelligence literature (Lescab, 2019). However, the negative news seemed not to be yet influencing stock-exchange, or the general situation in Finland at the time.

Figure 4 presents the media sentiments classified by media type during the first wave of the pandemic.

The findings indicate that the media sentiment has been mainly negative in discussion forums, opposed to the editorial newsfeed, which is larger, and mainly neutral and positive. The editorial newsfeed includes more editorial style communication, also with risk-reducing elements and multiple views. The discussion forums have mainly been a channel for spreading concern about the COVID-19 pandemic. In general, the corona-related negative hits were mainly concentrated to discussion forums, which is logical due to more general sentiments, including the content of SoMe.

In order to analyse the impact of the early-stage media-spike, the Nuortimo *et al.* (2020) scale for SoMe firestorms was applied as a basis for estimating the general influence. Even though the original scale was developed for analysing media scandals, it seems to be valid also for this type of an incident. Although the situation differs from a typical single-incident based firestorm, such as a personal scandal, which is typically a more intense and visible as a negative burst targeted towards a single person or entity, this case seems to form a similar effect, which in this case was a global large scale media firestorm. The pandemic and its effect on media visibility in this case can be considered to resemble a SoMe firestorm.

A level 3 firestorm on a scale from 1 to 3, as in the Nuortimo model, is considered to have a large global influence: the COVID-19 pandemic presents a viable example of an event with global influence. When estimating the impact of the corona media-spike in the Finnish language, both the editorial and SoMe sources included the following variables to be addressed: the length of the media spike/days, the height of the spike (media hits SoMe/editorial) and the percentage of negative media hits. By multiplying these variables, a figure that indicates the magnitude of the media attention on the scale 1 to 3 is determined. The magnitude equals the length of the media spike/days, multiplied by the

height of the spike (media hits SoMe/editorial), multiplied by the % of negative media hits. The result in case this case would be = approximately 90 days * 4000 media hits * 0,2(20%) negative media hits resulting in the figure of 72,000, in the Finnish language context only. This would mean the magnitude of the media attention on the global scale would reach the value 3 (1-3 scale) in the Nuortimo model based on the Finnish hits only. The figure would be much larger with the total global hits, which makes it a rather large figure considering that this is based on the Finnish hits only. Gaining global media coverage, the global media hits are limited by the available computational power. Also, despite the unusually low percentage of negative hits related to the media firestorm, the length and intensity contribute to the influence. Hence, the measured influence in general can be seen as global and very large, with influence on all companies at all levels.

After the initial analysis of the large pool of media sources to reveal the magnitude and trend of media attention, specific focus was given on the potential early warning spikes on the timeline of media attention. The COVID-19 media hits falling within the potential early warning signalling period in different media were analysed (Table 2).

By the end of January 2020, a logical weak/predictive signal chain from different media was in place to possibly enable predicting the main spike of the COVID-19 related media hits (the FS event in Figure 3). With the help of the predictive signal, it might have been possible to partly estimate the drastic effect of the events on the Finnish stock exchange starting on February 17th, 2020. The specific level of action taken by individuals and corporations during the time are outside of the scope of this paper. Nevertheless, this paper indicates that a weak signal of the upcoming Corona pandemic existed, and Finnish corporations could have used the signal to react to the event beforehand. The case of COVID-19 and the timeline of related media attention presents an example of 1) a real-life weak signal, and 2) the capabilities to detect significant events via modern media-analytics.

The major question in the managerial reaction would be whether the early warning signal from Chinese virus spread could have possibly been better utilised by the Finnish companies. In the early warning signal analysis, it was eventually clear that this type of virus could cause a global pandemic. Hence, early indications of major threats might be possible to link to early actions with logical reasoning in corporate management. In this case some of the preventive measures that were eventually started in March-April 2020 could have been initiated already in the beginning of the year. However, whether the companies have spotted this signal in their media monitoring and market intelligence function remains open in this analysis.

In general, if comparing the COVID-19 media firestorm to the earlier studied SoMe firestorm scale 2 incident (Nuortimo *et al.*, 2020), where the loosing of corporate reputation caused by a wrong wording was a general reason for corporate actions, this firestorm did not seem to clearly influence the corporate image or reputation. Predicting upcoming media firestorms and being able to link them to logical reasoning might benefit the future corporate market intelligence function.

Table 2 Samples of main topics appearing in the media during the potential COVID-19 early warning signalling period.

Source	**Date**	**Topic**	**Indications**
News/Finnish institute for health and welfare	16.12.2019	What is coronavirus	Start of discussion
Local news, "Aamuset" (city media for Turku)	9.1.2020	Pneumonia cases in China possibly originated from coronavirus	First signals of coronavirus in China
Local news	30.1.2020	WHO announces coronavirus as a global threat	Virus is spreading from China, WHO global threat classification
Facebook	30.1.2020	Coronavirus is more lethal than seasonal influenza, spreads more slowly for now	First popular estimates of threat severity
News/ "Lentoposti" (Aviation news)	30.1.2020	KLM cancels Chinese flights	First corporate actions
"Yle" News (the Finnish Broadcasting Company)	31.1.2020	Coronavirus death toll now over 210 persons, keeps spreading in China	More implications of threat severity
Yle Areena	31.1.2020	Chinese tourist had coronavirus in Rovaniemi, Finland	First signs of virus spreading to Finland

5. DISCUSSION

This study highlights the possibilities of estimating and measuring the impact of large-scale media appearance (COVID-19 pandemic in this case) on stock-listed companies (Nasdaq Helsinki in this case) via algorithmic media monitoring by targeting a vast pool of media through suitable algorithms. The presented approach consists of a large dataset media sentiment analytics via a black-box software, applied on COVID-19 over an extended time-period, initially appearing as a media firestorm, and comparing the timeline of events to stock market behaviour. The magnitude of the media firestorm is assessed and implications for company analytics considered.

The main results are as follows:

1) The impact analysis of COVID-19 based on a large dataset and media firestorm scaling can indicate an influence at a general level, such as the immediate impact on stock exchange performance. The sentiment and visibility in different media, including the social media and editorial sources, can reveal some general issues related to the impact, i.e., how negative has the sentiment been, and how much media coverage is in question.

2) The early warning signal could be spotted in this case to provide insights for preventive action, should this type of analysis be utilised in corporations.

3) The managerial actions could be initiated more proactively in case they need to react to early warning signals.

4) Theoretical debate remains, whether the event can be considered a black swan due to both global and local weak signalling received from the event. This provides basis for some general scientific counter-argumentation.

The main managerial contribution includes the possibilities for faster indication of negative future events that may come with early warning signals before the firestorm of large-scale media attention. Being able to link this type of modern analytics to the imminent risks by the means of logical reasoning may benefit the future corporate market intelligence function and enable earlier corporate reaction or risk management. Hence, managerial actions could also be planned faster and more accurately. In this case, if the actions could have started already in time of the early warning signal with allocation to different functions of the company, obvious functions would have been crisis communication, financial planning, and health, safety and environment in HR- function.

The scientific research method development aspect is beneficial compared to interviews and questionnaires. This type of an approach is a relatively fast way to get the main event influence from a large dataset. To get to the detailed topic level, a hybrid approach (Nuortimo, 2021), could be applied.

The novelty of this research lies in the innovative combination of data, methodology, and modern analytics. The findings support earlier studies on predictive analytics that aim for informed decisions through finding patterns in data and combining the data with logical reasoning. When comparing to the literature, the debate of classification of the COVID-19 coronavirus pandemic remains, whether the event is a black swan and if it has some early warning signalling. Globally, there has been previous signs of earlier pandemics (EIDs) before (Inayatullah, 2020), and locally the warnings have been received also in Finland. In case of measuring the event, this article tests the SoMe firestorm scale (Nuortimo *et al.,* 2020) level 3 and has implications. Even though level 3 of the scale can contain multiple types of events with a global influence, the scale seems to be applicable for measuring the general event magnitude also in this case. As a scientific contribution, this paper proposes two possible event classifications:

1. Black swan with both global and local early warning signaling
2. Social media/media LVL 3 firestorm with:

   a) Features that relate to global pandemics

   b) Some level of early warning signaling, usually related also to scandals

   c) Lower level of measured negative sentiment in general newsfeed compared to a regular scandal

   d) Large diverse global influence on multiple sectors

   e) No clearly visible influence on corporate image or reputation

One major limitation of this paper, however, involves the fact that the inaccuracies related to the algorithmic analytics prevents reaching a 100% research validity while utilising a black-box software. Utilising a second software in parallel could have increased the validity. Nevertheless, in this case, 100% validity may not even be necessary, because the goal is to measure the general level of influence, not the details related to, for example, corporations. The get to the detailed level, a hybrid approach (Nuortimo, 2021) is suggested, while leaving some room for further studies related to the COVID-19 coronavirus pandemic influence. Also, this study does not carry out correlation analysis. Future research concerning media firestorms is required to further validate the scale to assess the magnitude of different types of events, while the general scaling level seems appropriate for assessing this type of events with a large impact as well.

6. CONCLUSION

Better integration of the market intelligence function, namely media monitoring through the utilisation of new tools, may enable linking the early warning signals of significant future events to necessary corporate actions or risk management earlier than currently possible. The findings of this article agree with Inayatullah (2020) in that COVID-19 was not a total black swan and could have been partially anticipated.

The magnitude of events might be possible to assess by means of media firestorm scaling to provide input to company processes to have grounds for reacting to different events spurring from the business environment. These events also include black swan type media firestorms that have a very large impact and low predictivity. In the case of the coronavirus pandemic, the early warning signal was available from China's situation to the Finnish market before the market reacted. The type of approach suggested in this paper can be useful for planning preventive actions in similar situations, even if not all future events are the same.

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Competitive intelligence application: The case of geothermal power plant development in rural Tompaso, North Sulawesi, Indonesia

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ABSTRACT The vision of the community around geothermal power plants and the development of the power plants should be based on sustainable development principles, without jeopardizing the quality of life and justice for communities surrounding the power plant. This research aims to: (i) identify issues that arise as an result of the development of geothermal power plants in rural Tompaso, and (ii) find solutions to the issues to minimize the conflicts that arises from further geothermal power plant development in rural Tompaso and its surroundings. This study is based on the competitive intelligence research method. The results show that the development of geothermal power plants in Tompaso has a negative impact on the natural and social environment. The technical solutions offered include: (i) bioremediation by cultivating plants that absorb arsenic; (ii) biosulfurization and desulfurization for reducing air pollution, especially sulfur; (iii) floods and extreme drought managed by improving infrastructure and reforestation; (iv) social conflicts (land acquisition, working days, labor recruitment and settlement security) are solved by intensifying program dissemination to the community and involving local communities in decision making. The recommended policy provides incentives to the local community through strategic programs for the development of human and natural resources.

KEYWORDS Competitive intelligence, environmental issues, geothermal power plant, rural Tompaso

1. INTRODUCTION

Indonesia's vision in 2045 is to become the fifth strongest country in the world economically with a GDP of US $7.3 trillion and a per capita income of US $25,000. This can be realized by investment and trade: in industry, tourism, the marine environment, services, supported by reliable infrastructure and strong food, energy and water security. Indonesia plans to launch a new renewable energy mix in 2050 making up 31% of the total national energy (Kementerian PPN/Bappenas, 2018). One renewable energy source that is environmentally friendly and supports sustainable development is geothermal energy.

Indonesian Law No. 30 (2007), concerning energy, states that the National Energy Policy should be prepared based on the principles of fairness, sustainability and environmental insight to support the creation of energy

independence and national energy security. This policy confirms that energy diversification is a necessity to meet national energy needs.

In the industrial era 4.0, the development of electric energy generation is a necessity to meet the energy needs of Sulawesi Island, Eastern Indonesia. One of the available sources of electrical energy is geothermal power plants (GPPs). GPPs are power plants that uses geothermal energy as an energy source.

The objective of the development of GPPs is the availability of geothermal energy to meet regional and national needs. It can be achieved by prioritizing the sustainable development principles without jeopardizing the quality of life and justice of the communities surrounding the plant.

Geothermal energy resources produce renewable energy that is clean and environmentally friendly. This energy is available in abundant quantities and can be exploited with many technologies (Zhang et al., 2019). The development of GPPs is one of the important energy sources that produce green energy that is free of carbon dioxide emissions in the world (Hossain, 2016), including in Indonesia.

The development of geothermal power plants is aimed at meeting national energy needs in the era of industry 4.0 (Salimova et al., 2019) and in the era of society 5.0 (Fukuyama, 2018). The availability of this energy in the framework of supporting national development is necessary so that Indonesia's goal of becoming the fifth strongest country economically in the world can be realized.

The development of GPPs must be carried out by prioritizing the principles of sustainable development without endangering the quality of life and justice for the community around the geothermal power plant. This means that all progress with renewable energy should aim to improve human welfare and the quality of the environment.

However, GPP development initially will have a negative impact on the surrounding community (social environment) and the surrounding natural environment. These negative impacts include the emergence of social conflicts in the community and loss of water resources. The most extreme impacts are that the surrounding communities may lose their homes, workplaces and business land due to the mudflows (Farida, 2013).

The construction of GPPs is usually carried out by the urban community in the rural community. In this connection the urban community will bring technology and information to the rural community, and then the rural community will provide the material and energy back to the urban community. In this connection the urban community will exploit the village community (Rambo, 1983) and efforts and policies are needed to balance the relationship between the two groups so that the negative impacts can be resolved.

Research on the problems posed by the development of GPPs in rural areas and research related to their solutions is still minimal. Natural environment problems related to water pollution by arsenic can be solved by designing special plants that can absorb arsenic in the wastewater reservoir (Mohammed Barznji, 2015) and air pollution by H2S can be solved by desulfurization and bio-desulfurization (Munir et al., 2010). Still research on the impact of the social environment is still lacking. However, comprehensive research related to natural and social environmental impacts and their solutions is needed to provide comprehensive information for stakeholders, including local communities.

The North Sulawesi Lahendong GPP has been operating since 2001 and is currently producing electricity with a total capacity of 120 MW. This has met 60 percent of electrical needs in North Sulawesi province. The Lahendong GPP already has six GPP units, each producing 20 MW, of which the lasts two units, namely units 5 and 6, are in Tompaso (Handoko, 2010). The GPP in Tompaso has acquired around 19 ha of land, nine ha of which are paddy fields. GPP Tompaso has six production wells and two injection wells.

The implementation of the well drilling project and the construction of the GPP in Tompaso had caused problems for some people around the well fields and the GPP construction site. Because of that, many residents refuse the presence of the GPP project for unit 8 that will be set up near water sources.

Based on these facts, the questions that arises are: (i) what are the negative impacts caused by the development of the GPP project on the social environment and natural environment in rural Tompaso, and (ii) what are the solutions to solve the negative impacts caused by the GPP project in rural Tompaso?

Based on these problems, the aims of this study are to identify problems in the

community caused by the development of GPPs in rural Tompaso and to find solutions to these problems to minimize conflicts arising from future GPP development in rural Tompaso and its surroundings.

The aim of this research is to provide input for Pertamina Geothermal Energy (PGE), the government and surrounding communities in geothermal management, which on one hand can meet national energy needs and on the other hand maintain the preservation of the natural environment as well as improve the quality of the social environment.

2. RESEARCH METHOD

This research was conducted from January to June 2019 in Tompaso District, Minahasa Regency, North Sulawesi Province, Indonesia, especially in units 5 and 6 of the local GPP.

This study uses the competitive intelligence (CI) research method as its policy research method (Dou et al., 2019).. This can be used to produce a development strategy for businesses or organizations (Tulungen et al., 2021). CI is a systematic process for collecting and analyzing data and information as well as understanding information in the context of compiling recommendations to answer problems faced by the organization (Dou & Manullang, 2003; Tulungen, 2019). CI is a method of approach and set of tools to help create intelligence (Dou et al., 2019). CI is a circular process (Kahanner, 1997; Vriens, 2004; Garcia-Madurga & Esteban-Navaro, 2020)(Figure 1).

A plan starts with a vision, but in reality problems arise relating to the achievement of the intended vision (Tulungen, 2012). Based on the research problems, an information-gathering plan was developed to solve the problems. The information collected is primary information and secondary information (Dou & Manullang, 2003). Primary information aims at answering the first goal and secondary information aims at answering the second goal. Sources of primary information are informants involved in the PGE project and the people who are influenced directly by the development impact. Information was collected through open-ended interviews with the informants and through direct observation at the project and affected locations. Secondary information is from documents, such as textbooks, reports, scientific journals, and other documents. The collection of secondary information is mostly done through online sources (Tulungen, 2020).

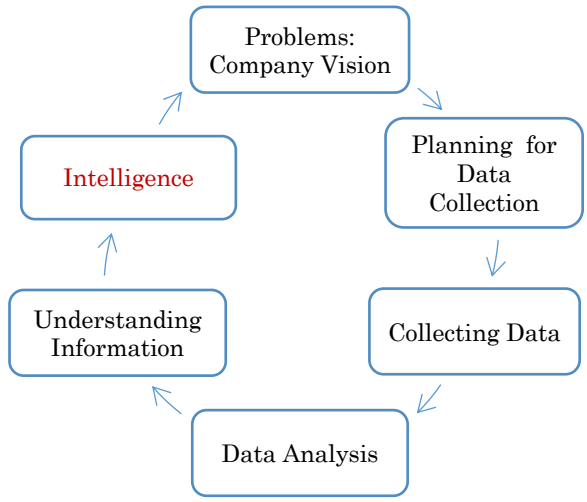

Figure 1 The competitive intelligence process.

Data analysis is done by grouping the data according to themes, namely the social environment or the natural environment. Each can be distinguished into sub-themes until it creates a unified whole and meaning. The results of the data analysis are then understood, through a deep and more comprehensive thought process (Tulungen et al., 2020). Based on this information, understanding can create intelligence as a recommendation for solving negative issues and further considerations for the development of the GPP and the community surrounding the GPP.

3. RESULTS

3.1 The natural environment

3.1.1 Water pollution

Water pollution occurs in two ways, first at the time of well drilling and second at the end of the drilling. During drilling, the drill bit can be released if the drill bit hits a solid material. To remove the drill bit, the well that has been dug is filled with thousands of liters of diesel oil. As a result, the groundwater is polluted with the diesel oil. After the drilling is completed, water or water evaporation coming out of the well is discharged into the reservoir. This water may contain toxic heavy metals such as arsenic. Because the reservoir cannot accommodate this wastewater at certain times, it overflows into the surrounding ground. As a result, surface water or ground water becomes polluted by arsenic.

Surface or ground water that is polluted with arsenic will contaminate agricultural fields, such as rice, with arsenic. The ground water that is used for drinking water by

humans and animals will be contaminated with arsenic as well (Hariyadi et al., 2013).

Based on the research by Hariyadi, the quality of waste water from the Lahendong GPP is poor, consisting of high arsenic concentrations of 1.2 mg/l (at point 1) and 1.26 mg/l (at point 2)(Hariyadi et al., 2012). This amount exceeds the limit that can be tolerated, which is 0.05 mg/l for arsenic (Presiden Republik Indonesia, 2001). Exposure to arsenic can trigger liver, kidney and skin cancer and also heart disease. Consuming arsenic-contaminated water can cause miscarriages, low birth weight babies and poor cognitive development in children (Rahman et al., 2009; Tofail et al., 2009).

Water pollution by arsenic can be overcome by improving waste water storage tanks and treating the wastewater (Mohammed Barznji, 2015). Planting the surrounding area with Monochoria vaginalis, Salvinia molesta and Colocasia esculenta will help reduce the arsenic concentration due to their ability to absorb arsenic in wastewater from GPPs. The highest arsenic absorption occurred in the roots of Monochoria vaginalis (22,289 mg/kg), followed by the root of Salvinia molesta (19,2335 mg/kg)(Hariyadi et al., 2013).

3.1.2 Air pollution

Air pollution is caused by increasing sulfur content (H2S) in the air. Air pollution occurs both around the well or GPP as well as in locations far from wells in Tompaso district. The level of pollution in the area around the wells is higher than the area far from the wells. This air pollution can be easily detected, for example by noting corrosion on zinc roofs faster than usual. This air pollution can also be seen from affected plants around the well, such as tomato plants that fail to bear fruit. In addition, rice production per ha is lower compared to before the drilling of wells by PGE. For example, if farmers were able to harvest 15-20 bushels per 355m2 (waleleng), now they can only harvest 10 bushels per 355m2 (waleleng).

The increase in sulfur content in the air will cause the release of greenhouse gases from below the earth's surface. With a GPP, these gases will reach the surface of the earth and therefor pollute the surrounding air. The air around the GPP was polluted by hydrogen sulfide (H2S) (Layton et al., 1981).

Reducing the sulfur levels from the well into the air can be done by desulfurization. The higher the concentration of Na2CO3 solution, the more NaHS is absorbed, which at a concentration of 11% can reduce H2S gas by 87.86%. In other words, if the concentration of H2S gas emissions from GPP activities ranges from 4800-6600 ppm, then with the absorption process the H2S gas emitted into the ambient air decreases to 582-801 ppm. With the process of bio-desulphurization (Rhodococcus sp.) the formed sulfur crystals were an average of 52.01% on a field scale and an average of 71.28% on a laboratory scale (Munir et al., 2010). Decreasing the quantity of production due to sulfur exposure needs technological innovation to obtain plants that are resistant to high-producing sulfur.

3.1.3 Flood and drought

Changes in land use from paddy fields to other crops and other uses have caused the water reservoir area to become narrow. As a result, if there is high intensity of rain it will cause flooding in the fields around the drilling that can impact the rice production.

Changes in land use from forest land to barren land have caused a reduction in water resources around the site. Tree clearing due to land clearing for the GPP project and drilling have caused the loss of several of the springs around the project. Water sources that irrigate rice fields in several villages in the Tompaso sub-district are deminishing. Areas in the downstream part of the GPP project are very vulnerable to drought and the loss of water has resulted in yearly losses of harvest.

Floods and droughts can be overcome by improving infrastructure, such as the normalization of the Panasen River, and improving vegetation on the headwaters by building community forests or reforestation. This includes the requirement for PGE Lahendong to expand the area cleared for drilling wells from five hectares to ten hectares, of which five additional hectares are designated as village forests.

3.1.4 Conversion of paddy fields to drilling fields

The geothermal development project in Tompaso has closed around nine ha of rice fields. Of this, five hectares was for drilling wells and four hectares was for water pipelines from production wells to injection wells. This is contrary to the government policy regarding the acquisition of paddy fields. Rice fields that are converted into drilling sites should be substituted with the same amount of land, but in reality there is no substitution of rice fields.

In the future it is necessary to consider rice fields as a final consideration in determining the location of well drilling. Besides that, every productive land acquisition must be replaced by other land (Presiden Republik Indonesia, 2011). The decision to locate the project on the paddy fields should be the last alternative, and an effort should be made to locate the project far from human settlement.

3.2 Social environment

3.2.1 Land acquisition conflict

Public concern first arises when land acquisition occurs. The concern is due to the lack of effort from PGE to let people know the location of the project and the land acquisition. Land was acquired before people were aware of where it would be and that the acquisition would occur. In addition, conflicts happened between members of the families who need to sell the land to the project. This is due to the fact that there are family members who have received the compensation of the family-owned land without the knowledge of other family members.

To prevent the conflict during land acquisition, early socialization is needed in order for the local people to correctly understand the project planning and implementation. Furthermore, the surrounding community should be involved in the decision making related to land acquisition and the fixed prices of the land.

3.2.2 Worker recruitment conflict

Worker recruitment is carried out by a contracting company assisted by a working group. The working group consists of village heads (HukumTua) surrounding the well or the GPP. Worker recruitment for skilled labor was carried out directly by the contractor and for unskilled labor, such as security workers and day laborers, recruitment was carried out by the HukumTua as a member of the working group in their respective villages. Even though the village heads were involved, recruitment conflict always occurred. There are two kinds of conflicts occurring, namely between the village heads and the people who want to work and secondly between the contractor and PGE Lahendong and the people around the project. The village heads used their authority in recommending the workers who are only close to them. The contractor recruits people that they think can help protect their interests during the project. As a result, people who were not recruited revolted against the village heads and community leaders revolt against the contractor and PGE Lahendong. This is due to this fact that there were jealousies from the people and that only certain people were accepted. Namely, people who were close to the working group and people related to the contractor and PGE Lahendong worked for the project. This conflict had encouraged people who were not included to demonstrate and rebel against the decision. During the GPP development projects there have been more than ten demonstrations carried out by the local community with various demands, such as asking for PGE Lahendong to socialize the project, requesting transparency about employment opportunities, and refusing workers from outside Tompaso to work in the projects. In addition to that, the local workforce can only meet the needs of low and specialized skilled workers, who do not require skills.

Related to the conflict of the employee recruitment, the project needs to inform the community about the needs of the workforce, including the specifications of the needed workforce, involvement of community and religious leaders in the determination of workers, and should pay attention to community representation in the project.

3.2.3 Working days and hours of operation

In the process of the GPP project development in Tompaso, the working days are Monday through Saturday. Developers do not recognize holidays, especially Sundays. The culture of the local community forbids people to work on Sundays, especially during worship hours. Having a working day on Sunday led to protests from the local community. In addition, the noise and vibration caused from drilling wells are very disturbing during worship activities in the church.

Conflict about days and hours of operation can be solved by communication between community leaders, religious leaders and the developer. For example, there should be recess on Sundays especially during church services.

3.2.4 Settlement security

The existence of the GPP project has resulted in two kinds of fears among the village community. Firstly, local people worried about security and the entry of numerous workers from outside the community from different cultural backgrounds. Secondly, the existence of the GPP project could bring misfortune to the community, such as mudslides or the

decline in land area. This is influenced by the recent Lapindo mud disaster in East Java that drowned several villages surrounding the Lapindo Geothermal Plant (Farida, 2013). Also of concern are the results of research in units 1 and 2 in the Lahendong GPP exploitation area, which had reduced the land surface level by three to four cm (Kurniawan & Anjasmara, 2016).

The concern due to the incoming workers from outside of the area who live together within the village community can be reduced when there is a good interaction within the local community. Public concern about the fears of Lapindo's effect to the community can be overcome by public awareness that the Lapindo mudflow incident was not caused by drilling but rather due to the natural disasters that happened in East Java.

4. DISCUSSION

The development of a GPP is intended to meet national energy needs by prioritizing the principles of sustainable and equitable development. To achieve this goal, we need to pay attention to issues that are developing in the village surrounding the GPP project and also learn from the many experiences that have occurred in other regions and countries.

To solve these problems, the CI approach can provide solutions related to strategic programs and operational programs. The strategic program is under the authority of PGE, as the person in charge of GPPs throughout Indonesia, while the operational program is a program that is mutually agreed with the local community and the local government.

Local people are those who produce geothermal energy or energy producers and outsiders are energy users. In relations between communities (environmental systems), in a state of nature, the more stable systems (cities, elite groups) will exploit less stable systems (e.g., villages, marginalized groups). Energy and matter will flow from villages to cities (Rambo, 1983). Based on this fact, it is necessary for certain parties to intervene to create a balance between rural and urban areas, between the social environment and the natural environment, and between marginal groups and elites by providing incentives for villagers through national and local policies so that the principles of sustainable development and justice can be realized.

National policies will be realized in the form of national strategic programs and local policies. This will be in the form of local strategic program policies (Dou et al., 2020). Strategic programs at the national level are programs built to maintain and improve the quality of the social and natural environment around GPPs and geothermal wells. Based on the results of this study, the national strategic programs that can be offered are making forests around GPPs and geothermal wells, making wider reservoirs so that arsenic does not spread, reducing arsenic by planting plants that absorb arsenic, and paddy fields are the last option for location for the GPP and geothermal wells projects, GPPs and geothermal wells are built far from settlements and improve the quality of community resources around GPPs through education.

The strategic program at the local level aims to improve the quality of human resources in the surrounding community. Improving the quality of education can be done through education and training assistance. Education is formal education, from kindergarten to higher education, while training is according to the needs of the local community.

Since the Covid-19 pandemic in Indonesia, the teaching and learning process from elementary schools to universities has been carried out by distance learning (online) since March 2020. The main problems faced by rural communities, including in the Tompaso countryside around the GPP, in distance learning are the weak internet network, the absence of smartphone or computer devices, and funds to purchase data packages for students (Amalia & Sa'adah, 2020). Based on this fact, the strategic programs at local level must provide an internet network, smart phones, and data quota assistance for students around the GPP.

The absence or weakness of the current internet network must be anticipated by building satellite internet. Satellite internet is one type of internet independent of a cable network which directly uses satellite as its transmission medium. Satellite internet procurement is financed by PGE through corporate social responsibility funds. With this satellite internet, the problem of internet access or internet network and data quota or data credit costs in distance learning can be resolved. Some of the available providers include: Karunia Sinergy, Viasat, Hughes-Net, and Kacific. These providers provide satellite internet and telecommunications services to

customers in remote and rural areas. It can serve 100 networks with a distance of 1 km for 24 hours/day with an internet package cost of around Rp. 2.2 million/month. Through this program, the community, especially students, can participate in education through distance learning online.

The role of the government, PGE, and the surrounding community are very important in maintaining a balance between the social environment (social system) and the natural environment (ecosystem), as well as the balance between villages and cities. Energy will flow from the village to the city, so to balance the two ecosystems, materials and information from the city must be conveyed to the village. For this reason, a collaboration platform between stakeholders is needed in order to support and accelerate the flow of information and materials from cities to villages. The platform is in the form of an information system (Elitan, 2020) that allows all stakeholders to sit together to plan, implement and supervise programs to improve the quality of the natural and social environment around the GPP.

Tompaso GPP as an energy generator must be supported by all stakeholders. The existence of the GPP must be able to improve the quality of the natural environment (e.g., water, air, soil, sunlight, plants, and animals) and the quality of the social environment (e.g., education, health, economics, culture, law), particularly the local environment in which the project or business is located.

GPPs are part of a strategic renewable energy industry, and need to be supported by cooperation between the energy source community and energy users, the government, PGE, and universities to create innovation (intelligence) in order to develop them (Pique et al., 2018). With the cooperation of these stakeholders, GPP units 5 and 6 will be able to continue and the development of other GPP units can be carried out with more competitiveness and better quality by prioritizing the principles of sustainable development.

The CI approach and method is used by companies, both national or multinational (Prinsloo, 2017), and including small, medium, and large companies to be able to win the competition with similar companies (Hassani & Masconi, 2021; Nte et al., 2020), but also by the government and local governments to advance their regions (Ezenwa, 2018). CI is also used by organizations and communities to achieve their vision and goals. In this regard, this CI can be used to evaluate the implementation of GPP development and post-GPP development. Based on findings in this research, we can be concluded that the development of a GPP in rural Tompaso, especially unit 5 and unit 6 in rural Tompaso, is not in accordance with the goals and vision of PGE and the local community around the GPP project.

The vision for the community around GPPs should be based on sustainable development principles, without jeopardizing quality of life and justice. This means that PGE must operate efficiently in its development, not harm the community around the project, and not damage the social and natural environment. Or in other words, the development of the GPP must prioritize the principles of economy, benefit, justice, and sustainability. Thus CI can be used for the construction and development of projects for the public interest with a new vision (Dou et al., 2020), that is not only based on economic aspects but also based on social and natural aspects.

With the internet network, both through base transceiver station and satellite internet in the rural Tompaso, it will make it easier for the community surrounding the GPP project to build an information system or smart village (Andari & Ella, 2019). This smart village will serve the community in relation to government administration as well as the information needs of the community and other stakeholders (Syaodih, 2018). The development of this smart village can initially be realized through the cooperation of the village government, universities, and PGE (Imre, 2015).

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

Problems with GPP development include: (i) Natural environment: water pollution by arsenic, air pollution by sulfur, floods and drought, conversion of paddy fields to dry fields, (ii) Social environment: conflicts of land acquisition, recruitment of workers, working days and hours of operation and security of local resident. Some solutions to the natural environmental problems are (i) water pollution, such as exposure to arsenic in water can be overcome by increasing wastewater collection basins and wastewater treatment, (ii) air pollution and reduced crop production by sulfur can be overcome by desulfurization,

and (iii) floods and drought can be overcome by improving infrastructure and reforestation. Solutions to social environmental problems such as (i) land acquisition, (ii) working days and hours, (iii) recruitment of workers can be overcome by a program of socialization with the community and involving local communities in decision making, and (iv) security of settlements can be solved by the development of GPP projects far from settlements.

5.2 Recommendation

Recommendations that can be put forward are: (i) local communities should be included in decision making for location determination and recruitment of workers and should obtain benefits or incentives from energy produced through strategic programs from PGE, central government, and local governments (ii) cooperation between government/ PGE, universities and local communities should be carried out to find innovations, including plants that are resistant to sulfur, and (iii) the procurement of satellite internet to provide free networks for students in villages around the power plant to support online learning, and at the same time support should be in place for the procurement of smart villages.

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Strategic thinking and competitive intelligence: Comparative research in the automotive and communication industries

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ABSTRACT The main purpose of this study is to examine the effect of strategic thinking skills of executives on competitive intelligence in high competition intense industries. The concept of strategic thinking represents a cognitive process that was examined along with system thinking, creativity and vision dimensions. On the other side the concept of competitive intelligence was evaluated with the dimension of competitive intelligence context and the competitive intelligence process as a process that represents the systematic collection of information about competitors through legal and ethical ways. In this study, the concepts of strategic thinking and competitive intelligence are examined around the related literature and to what extent these concepts are related to each other was investigated as well. Since the research on this relationship has a unique attribution, it contributes to the related literature. To test the model formed in line with the main purpose of the research, data were collected from 628 executives, who work in five high competition intense automotive industries and three communication industries, using a questionnaire method. The developed hypotheses were evaluated with appropriate analysis methods. In addition, industrial differences were revealed by comparing the two industries with appropriate analyses. According to the findings of the analysis, the strategic thinking skills of both executives participating in the research as well as the executives working in both industries have a positive and meaningful effect on their competitive intelligence. The study has made a significant contribution to the literature in terms of examining and explaining the relationship between the concepts of strategy and competition through the interaction of strategic thinking and competition intelligence.

KEYWORDS Automotive industry, communication industry, competition, competitive intelligence, strategic thinking, strategy

This study is derived from the PhD thesis titled "Strategic Thinking and Competitive Intelligence: A Comparative Research in Automotive and Communication Industries" by M.E. Kula.

1. INTRODUCTION

Business history is written on the interaction of strategy and competition. While the necessity of the strategy needs the existence of competition, the fiction and pattern of the strategy have been guiding the scope and dimensions of competition. Today's environmental conditions make it impossible for businesses to achieve sustainable success by only making some plans and applying these plans step by step. Businesses have to find ways to cope with turbulent environmental conditions and hyper-competition. All of the

environmental factors that businesses carry out are vital activities and constantly changing. Businesses have to adapt to this drastic change and manage the change correctly.

Considering the age of information technology we are in, it is not an easy task to evaluate all environmental factors separately and to achieve the big picture by combining the parts. So, business managers must find answers to ever-changing questions such as: Why is one market and industry more profitable than another? Why is it riskier to trade in one region than another? Why are some businesses operating in the same industry more successful than others? What are the factors that make businesses successful or unsuccessful? What measures should managers take for the success of their businesses? However, all answers have a common purpose which is to give the business a competitive advantage. So, it seems possible to summarize all the questions stated above with a single question. How can businesses achieve a sustainable competitive advantage?

In the study, it was assumed that managers who have strategic thinking skills can use their competitive intelligence skills more effectively. In other words, the proposition that strategic planning will create competitive advantage, which has been going on for nearly half a century, lost its meaning with the introduction of information technologies. Therefore, in this study, the effect of strategic thinking, which is supposed to establish a bridge between the past and the future over the present, on competitive intelligence, which is a way of obtaining information that is supposed to provide competitive advantage, is examined.

In this study, answers to three questions have been sought based on this essential inquiry: Does strategic thinking affect competitive intelligence in industries with high competition intensity?": (1) Can business managers think strategically in competitive industries? (2) Do business managers care about the competitive environment and competitor analysis in competitive industries? and (3) How does strategic thinking affect competitive intelligence in the automotive and communication industries?

2. THEORETICAL FRAMEWORK

2.1 Strategic thinking

Strategic thinking is understanding that things cannot always be solved with a linear approach. For this reason, organizations have to find ways to adapt to environmental uncertainties in a more informed, agile and flexible way. At this point, strategic thinking emerges as a cognitive process that also takes competitive alternatives into account and reveals ways to solve environmental-organization uncertainties more sensitively and prudently (Fairholm and Card, 2009: 22; O'Regan, Hughes, Collins, and Tucker, 2010: 59). In other words, strategic thinking is not a sequence of systematic plans, but a pattern of cognitive planning. Rather than a road map to follow, it is a bird's eye view of all the roads to reach the destination. Thinking strategically, of course, requires being able to make predictions about the future, which is about determining the direction of all variables affecting the organization (Critelli, 2005: 48). In this respect, scenario and forecasting techniques attract attention as strategic thinking methods that organizations can use to discover unforeseen details and possibilities for the future (Ramírez and Selsky, 2016: 100).

Strategic thinking is seeing the future. However, it is not possible for managers who do not understand what has happened in the past to predict what might happen in the future (Mintzberg, Ahlstrand, & Lampel, 1998: 126). In this sense, people who can think strategically are people who use the past by looking forward, and who can predict the future by looking back. Therefore, strategic thinking can offer innovative solutions to complex events in a turbulent and hyper-competitive environment which has the potential to change the rules of competition and to depicture the future (Zahra and Nambisan, 2012: 220). As a result, the business environment is surrounded by many decision-making factors, and businesses are affected in some way by these decisions. The degree of impact is directly proportional to how effectively the enterprise can use its basic skills. For this reason, strategic thinking is the art of overcoming the opponent in a way and doing it with the same thing in mind that they are trying to apply to you (Dixit & Nalebuff, 2015: 7).

Mintzberg (1994b) argued that strategic planning is analysis and strategic thinking is synthesis, explaining the basic approach difference between strategic planning and strategic thinking. So much so that while strategic planning is concerned with how to implement the already determined strategic programs and methods, strategic thinking can

reveal the synthesis that will build the future of the business as a result of organizational learning. In other words, strategic planning is the analysis of systems and methods, while strategic thinking is a synthesis of intuitive, creative and innovative thinking (Steptoe-Warren et al., 2011: 239). According to Haycock et al. (2012), while strategic planning means the implementation of strategies within a systematic and logical system, strategic thinking is a process that encourages creative and innovative thinking to overcome the dynamic and often unpredictable difficulties encountered in today's economy.

This study was based on Bonn's three-dimensional strategic thinking model (2001). While Bonn (2001) defines strategic thinking as a cognitive way of solving strategic problems creatively with a rational approach, she states that strategic thinking consists of systems thinking, creativity and vision.

System thinking deals with the organization as a whole in interaction with its environment. There is a backward working principle, first to the whole and then to each subsection of the system. It tends to formulate basic strategies with a general to specific perspective (Haines, 2000: 34). In other words, system thinking is the ability to see the system as a whole in order to understand the properties, forces, patterns and relationships that shape the behavior of systems (Pisapia, Reyes-Guerra and Coukos-Semmel, 2005: 48).

Creativity is a human-specific intellectual process that can be beneficial to overcome existing problems to generate new ideas (İşcan and Karabey, 2007: 104). In the organizational sense, creativity refers to the ability to establish extraordinary connections between all business ideas that constitute the reason for the existence of the enterprise in line with the interests of the organization (Robbins and Coulter, 2012: 166). The strategy is to be able to develop creative ideas and innovative solutions in order to gain competitive advantage. In this sense, creative thinking represents a process that starts with generating ideas (Bonn, 2001: 65).

Vision expresses the future that businesses desire. The vision of a business is the declaration of its strategic intention that will enable the business to focus on achieving its goals and objectives (Craig and Campbell, 2005: 26). One of the most challenging tasks of managers is to keep the direction of the business stable under complex environmental conditions. In this sense, the vision can be defined as a vanishing point that shows the direction of the business (Moon, 2013: 1700). Vision, which is an important part of strategic thinking, helps business employees to work in a focused and motivated way without deviating from their goals. In addition, it contributes to businesses to see their current and future potential and to develop strategies accordingly (Fairholm and Card, 2009: 23).

2.2 Competitive intelligence

Businesses that want to turn environmental threats into opportunities should obtain systematic information about their competitors. The competition information process predicts that businesses take three basic steps behaviorally: obtaining information about the competitor, interpreting and adapting (Li, and Calantone, 1998: 16). Before giving details about the concept of competitive intelligence, which will be based on these three steps, it is useful to explain why the concept, which is also translated and used as competitive intel in the literature, will be used as competitive intelligence (systematic mind development on competitors) in our study.

When the place of competitive intelligence activities in business activities is examined, it is seen that the focus of the concept is knowledge, but more importance is placed on analyzing the acquired information rather than (secret) information acquisition. In addition, competitive intelligence is not a business function, but a cyclical, systematic and external environment-oriented process that has certain steps between its beginning and end. In addition, competitive intelligence does not mean analyzing what happened in the past, but acting towards the future proactively (Rouach and Santi, 2001: 554; Köseoglu et al., 2016: 163). As a result, competitive intelligence activities represent a dynamic and multi-dimensional structure as they are carried out in an environment where rules and players are constantly changing.

In addition, although it is not compulsory to utilize artificial intelligence technologies for competitive intelligence applications, it is indispensable at the point reached, given its contribution to decision-making processes; information is no longer just the publicly shared news, but the algorithms hidden behind them (Liebowitz, 2006: 13). In this sense, it will not be possible to call the concept of artificial intelligence artificial intel. Considering all these reasons, using the concept of competitive intelligence as competitive intel will be a "not

wrong but incomplete" expression, while using it as competitive intelligence will be a "more accurate and holistic" form of expression.

Many different definitions of competitive intelligence have been made by different researchers. Provided that the operating logic is the same, different perspectives are presented to the focal point of the concept in the definitions. Before giving a clear definition of what competitive intelligence is, it would be appropriate to explain what it is not. Competitive intelligence is not pages of thick reports, espionage, eavesdropping, information and document theft about the competitor. Its simplest form is to analyze the public information about the competitor (Fuld, 1995: 23).

Businesses basically want to learn about their competitors for three reasons: curiosity, enthusiasm, and foresight. They are curious about their competitors' activities simply because they operate in the same industry, and this curiosity can be simply satisfying. Curiosity is not satisfied with a certain level and if some of the competitors' activities are appreciated, the desire to envy and be like them will increase. Ultimately, as the industry and the competitor are constantly followed, it will be possible to make predictions about the future, independent of the competitor (West, 2001: 13; Wright, Pickton and Callow, 2002: 352). These behavioral approaches, which affect the strategic decisions of businesses in the long or short term, form the basis of competitive intelligence applications.

In light of the above information, competitive intelligence can be defined as systematically gathering information from the industry and competition environment, legally and ethically. I then involved processing, analyzing and sharing the information collected in order to take action-oriented steps and thus make predictions for the future in order to guide strategic decision makers in enterprises and to ensure that the enterprise gains competitive advantage. The two-dimensional structure developed by Saayman et al. (2008) was taken as the basis of the research of competitive intelligence within this study. They discuss the competitive intelligence context and process as described below.

The *Competitive Intelligence Context:* Competitive intelligence is a series of activities that enable systematic information gathering from environmental factors. The context of competitive intelligence consists of a number of attitudes and behaviors that form a framework for information gathering activities and directly affect them. First, competitive intelligence activities require organizational awareness. Managers should be aware of the events happening around them and develop an attitude in this direction in order to keep businesses competitive. On the other hand, managers should create a culture that encourages information sharing at all levels. This situation, which can be expressed as a culture of competition, includes all mental and operational activities that encourage internal information sharing and turn it into a useful tool. Since organizational awareness, organizational attitude and competitive culture cannot occur with the will and efforts of managers alone, systematic information sharing should be ensured with active participation of employees. These elements, each of which constitute the context of the competitive intelligence process individually, come together to form the context of competitive intelligence.

The *Competitive Intelligence Process*: The basis of competitive intelligence is that businesses gain strategic and sustainable competitive advantage. In this sense, the process of competitive intelligence refers to the process of creating information that will provide a competitive advantage to the business. In the process of competitive intelligence, first of all, the necessary information is determined and the necessary planning is made. The processes of collecting data from the external environment, transforming the data into information by analyzing it and distributing it to the relevant units within the enterprise are carried out especially with the help of information technologies, all of which are referred to as information design. Businesses internalize the information they obtain through the information design process, while making a competitive comparison, revealing the fundamental differences between themselves and their rivals. Ultimately, the process operates both as an important tool in the strategic decision-making processes of businesses and as an output that enables the business to determine its competitive position relative to its competitors.

3. THE RESEARCH MODEL AND HYPOTHESES

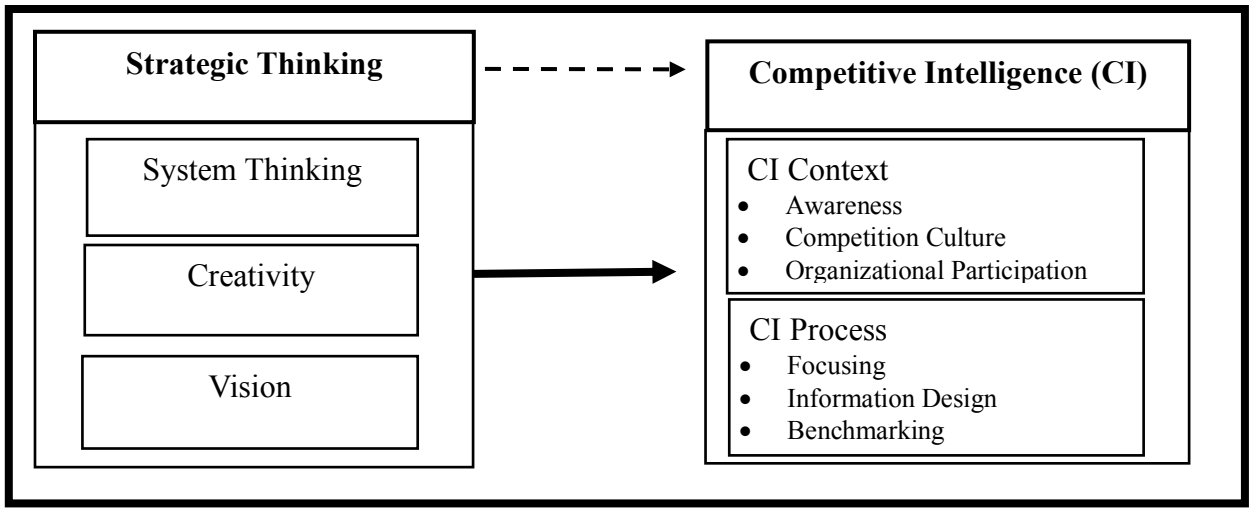

Figure 1 Research model: The effect of strategic thinking on competitive intelligence.

Although the importance of strategic planning and analysis of the competitive environment is accepted within the study, the interrelation and interaction between the strategic thinking skills of managers and their competitive intelligence has been investigated, especially in industries with high competition intensity and mutual firm dependence by considering the effect of technological innovations. As a result, the following model has been developed by discussing strategic thinking and competitive intelligence processes around the relevant literature.

In order to test the research model, the following hypotheses were developed in light of studies that reveal the relationships between the relevant variables by scanning the strategic thinking and competitive intelligence literature.

For managers, strategic thinking refers to establishing a systematic and structural link between events that are likely to affect the business directly or indirectly. In other words, strategic thinking can be described as a dynamic and innovation-oriented process as well as being cognitive. Therefore, decisions caused by strategic thinking are expected to be creative, original and changing rules in the competitive game (Heracleous, 2003: 25; Tovstiga, 2013: 16). The literature shows that strategic thinking and competitive intelligence start at the same point at the cognitive level.

Competitive intelligence requires a certain level of awareness and attitude before various information gathering activities. In addition, Schein (2004) points out the importance of valuing new thoughts, beliefs and assumptions while listing three basic elements of creating an organizational culture. In this sense, it is thought that there is a strong relationship between strategic thinking and the scope of competitive intelligence, given that managers can create a competitive culture at a certain level by giving importance to creative thinking, and they can ensure their contribution to the long-term goals of the enterprise to the extent that they can convince employees.

There is a significant relationship between the cognitive abilities of individuals and environmental factors. In other words, it is a process that requires the use of cognitive abilities for managers to consider and evaluate the complex structure that constitutes the business environment as a meaningful whole. Businesses are the main actors of industries. In this sense, businesses that want to create a sustainable competitive advantage and strengthen their competitive position against their competitors must first manage to see the big picture formed by small parts as a whole. Interpreting the big picture correctly to obtain the required information is possible with an organizational culture in which employees can demonstrate their creative talents. Opening up space for creative activities that will result in innovation is directly related to the vision of that enterprise because vision is not just a text that represents the desired future. Vision is the awareness and the attitude which an enterprise takes on about the future. Vision is not a future plan determined by the manager of interest, but a process that all employees must participate in. As a result, the fact that business managers have strategic thinking skills with all the elements is directly related to the competition perception and competitive position of the business. For this reason, it is predicted that strategic thinking affects the scope of competitive intelligence.

H1: Strategic thinking affects the competitive intelligence context.

H1a: System thinking affects the competitive intelligence context.

H1b: Creativity affects the competitive intelligence context.

H1c: Vision affects the competitive intelligence context.

What businesses understand from the general conditions of the industry, which is called the big picture, is important. An industry becomes competitive through the behavior of the businesses in the industry before the structural features of that industry. For this reason, it is important to see the big picture, to create a forecast against strategic moves and competitive moves of competitors (Gatignon and Deshpande, 1994: 275). As a matter of fact, one of the main features of strategic thinking is developing foresight based on environmental analysis. Managers who have strategic thinking skills should be able to develop a forecast beyond the horizon by successfully performing current situation analysis (Hughes and Beatty, 2005: 43). In this sense, strategic thinking skill requires focusing on the right information at the right time and completing the transformation of businesses through information design (Garrat, 1995; 124). The disclosed information shows that there is a keen relationship between strategic thinking skills and factors such as planning and focusing, communication and analysis, information design and benchmarking, and the competitive intelligence process explained.

As important as competition analysis is in the strategy formulation process, it is the focal points of managers in the industry that will guide the competition analysis. In addition, the way in which the information that will contribute to the strategy formulation process is obtained and how it turns into strategic information is also important. So much so that managers need creativity in business processes for both operational and strategic moves. While it is a necessity to support strategic moves with information about competitors, the way information is obtained and its interpretation often depends on the use of the creative skills of the employees in the relevant unit. In addition, businesses have to predict which steps to take and when and how to achieve their visions, which creates a need for systematic information, especially about the competitive environment. In other words, in terms of business activities, vision is not a dream but an imagined reality. For this reason, we predict that strategic thinking will affect the competitive intelligence process.

H2: Strategic thinking affects the competitive intelligence process.

H2a: System thinking affects the competitive intelligence process.

H2b: Creativity affects the competitive intelligence process.

H2c: Vision affects the competitive intelligence process.

Managers who have strategic thinking skills want to depict future situations. In addition, they try to steer competition and change because, besides its other functions, strategy is the art of determining attitude and behavior according to the complex structure of the competitive environment (Henderson, 1989: 140). In other words, the relationship between strategic thinking and environment is too extensive to be explained only by the relationship between the business and its external environment. Strategic thinking is the ability to look at the competitive environment through the eyes of the competitor, and to evaluate the components of yesterday, today and tomorrow as a whole. Such skills require the combination of cognitive ability and systematic knowledge, since businesses are living organisms that always interact with their environment. As a result, strategic thinking refers to the cognitive process that provides the collection, interpretation, transformation and evaluation of data that constitutes a sustainable competitive advantage of an enterprise (Haines, 2000: 35; Hughes and Beatty, 2005: 4). In this sense, it is seen that strategic thinking is a precursor of competitive intelligence and has a strong relationship with competitive intelligence.

Strategy is a structure built on the strengths and weaknesses of a business. The main question to be answered while building this structure is whether the enterprise creates an added value in line with its goals and objectives. In order to answer this question, it is necessary to look at the structure called strategy from a more holistic perspective (Jacobs, 2010: 4). This information highlights the importance of obtaining, interpreting and using information about competitors when needed in the strategy formulation process.

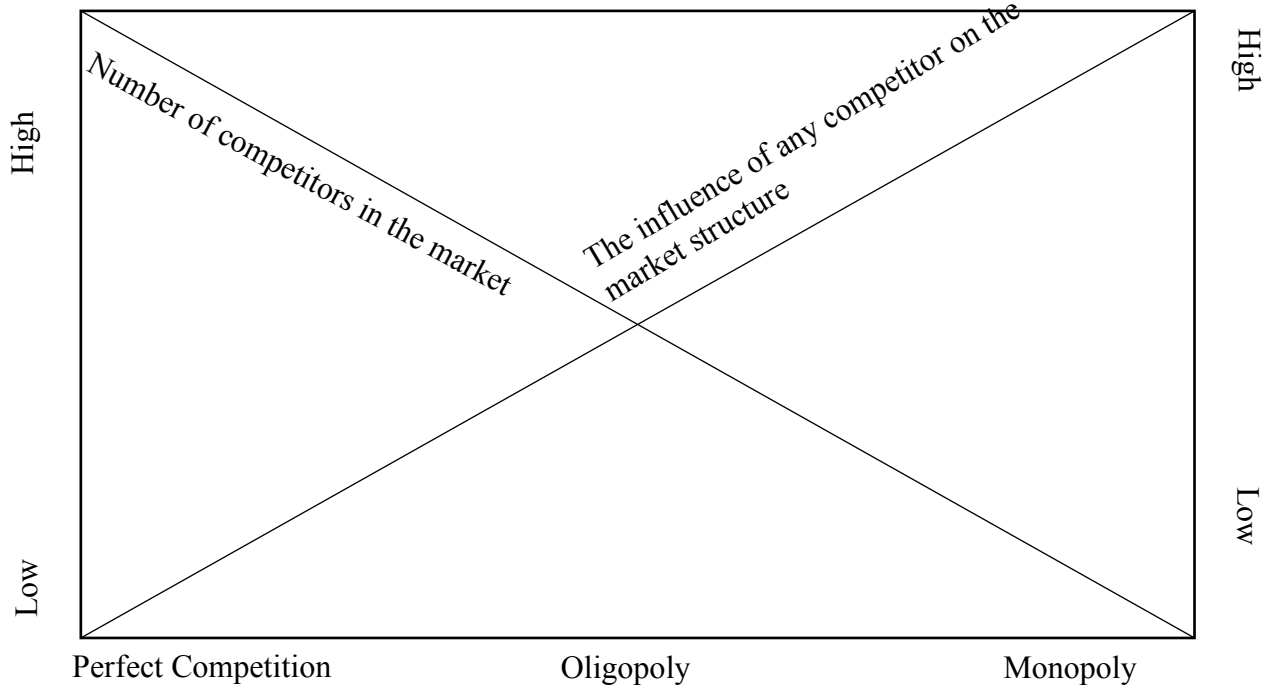

Figure 2 Continuity of market structure. Adapted from Cambell & Craig, Organizations and The Business Environment, 2005, p. 407.

While strategic decisions need competitor analysis, depicting a bird's eye view of the competitive environment in the mind and presenting the right perspective from the right angle is the strategic thinking skill. Therefore, it is predicted that strategic thinking affects competitive intelligence.

H3: Strategic thinking affects competitive intelligence.

H3a: System thinking affects competitive intelligence.

H3b: Creativity affects competitive intelligence.

H3c: Vision affects competitive intelligence.

One of the main problems of strategic management is that it has not developed enough theory to describe the behavior of firms and industries. For example, although it is known that intense competition in the oligopoly market may change places with stability from time to time or new technologies and competitors may have a serious impact, it cannot be predicted when or what results will occur. This is because the oligopoly market matures as a result of the dynamic interaction between firms, government, labor, consumers, financial institutions and other environmental factors. For this reason, the industry structure in the oligopoly market does not affect firm behavior but the firm behavior determines the structure and competitive dynamics of an industry at the same time (Levy, 1989: 167; Bartlett and Ghoshal, 1998: 87). In general, the market structure represents a continuum where businesses supply their goods and services and customers demand, with perfect competition and monopoly markets at both ends. Within this continuum, the relationship between the total number of competitors and the impact of any competitor on the market is shown in Figure 2.

An oligopoly market is a type of market where there are few companies with a high interdependence and interaction, and many competitive tactics are used to eliminate competitors (Hall and Bensoussan, 2007: 259). In this sense, the automotive industry is an ideal example for evaluating the oligopoly market, with its small number of companies on a global scale and its differentiated products (Goldberg, 1995: 892). Indeed, Sturgeon et al. (2009) stated that the automotive industry is unique, and that a small number of Japanese, German and American companies dominate the industry on a global scale and direct the behavior of numerous small and medium-sized enterprises from automotive and other industries. In addition, Çoban (2007) and Daştan (2016) stated in their studies on the automotive industry that the automotive industry has a strategic importance, which has the potential to lead other industries in the economy, and state that the development of

this industry is fundamental to trade policy for countries.

Staying competitive within this market structure will be possible by transforming creative thinking skills into innovative products, having a vision that will design the future, and responding to the behavior of competitors with strategic moves. In conclusion, considering the structural characteristics of the industry such as the degree of differentiation of the product in the automotive industry and its high place in the customer budget, the need for substitutes and suppliers, and the intensity of non-price competition on a global scale, it can be said that the automotive industry is located on the side of the oligopoly market, close to the perfect competition market compared to the communication industry (Figure 2). Therefore, it is predicted that managers' strategic thinking skills are high in the automotive industry.

H4. In the automotive industry, managers have higher strategic thinking skills than in the communications industry.

Another feature of the oligopoly market is the imitative firm behavior that develops because of firm interdependence. Accordingly, for example, the price competition initiated by any firm to gain competitive advantage will be instantly responded to by other competitors who want to host in the industry (Levy, 1989: 170). In this sense, the communication industry is one of the industries characterized by high competition, depending on its speed in technological change (Ganesan, 2007: 1).

Explaining the imitative behavior of firms through price competition alone would be an incomplete perspective. Firms can imitate not only price increase or decrease policies, but also business processes and outputs. He and Mu (2012), comparatively analyzed the technological learning processes between Chinese national companies operating in the communication and automobile industries and foreign companies that invest directly in China. According to the results of the research, compared to the automotive industry, companies operating in the communication industry can develop their technological learning skills and increase their technology capacity by competing directly with foreign companies.

The communications industry had a low-competition market structure dominated by monopoly firms. However, the 1980s caused structural changes in the communication industry, as in many industries, with the transformation of the market structure from monopoly to oligopoly from the transformative effect of technology as of the 1990s. Factors such as the privatization of state-controlled companies, the global widespread use of mobile phones and the internet network, and the redefinition of seller and customer relations meant a global spread of competition (Trauth and Pitt, 1992: 3; Wang et al., 2004: 325). A limited number of companies in the communication industry compete to increase their market share over a large number of customers. In this sense, short-term tactical decisions are as vital as the strategic decisions of companies. A formal competitive intelligence program has a determining effect on tactical decisions and a guiding power for the firm, especially in oligopoly market conditions where price competition is tight. As a result, the degree of differentiation of the commodity in the communication industry and its place in the customer budget is low. Considering the structural characteristics of the industry such as, for example, entry into the industry, and government permits, and the intense price competition on a local scale, it can be said that the communication industry is located on the side of the oligopoly market, but closer to the monopoly market compared to the automotive industry. Therefore, it is predicted that managers' competitive intelligence skills are high in the communication industry.

H5. In the communications industry, managers have higher competitive intelligence skills than in the automotive industry.

4. METHOD

4.1 Determination of research population and sample selection

Considering that it will be suitable for the measurement of the variables in the model, it was deemed appropriate to conduct the research in industries with oligopoly market characteristics. It is accepted that the intensity of competition is high in both the automobile and communication industry within the oligopoly market structure (He and Mu, 2012: 270). The research model investigates the effects of managers' strategic thinking skills on their competitive intelligence. In this respect, while determining the scope of the research, managers who will directly or indirectly contribute to strategic decisions and who have

the authority to make competitive moves partially or fully were preferred.

The scope of the research consists of automotive dealer managers which are executives of five companies with the highest sales brands according to Automotive Distributors Association (www.odd.org.tr) in 2018 and for the communication industry, the provincial and regional directorates of the three Turkish companies with the most subscribers according to the 2018 data of the Information Technologies and Communication Authority (www.btk.gov.tr).

The sample size was calculated as 306 for the automotive industry and 306 for the communication industry (www.surveysystem.com/sscalc.htm), with a 5% margin of error within the confidence limits of 95%. Considering the density of executives in the industries, the length of the survey form and the time they will devote to the survey, 500 surveys were distributed separately to both industries. After the incomplete, incorrect and damaged questionnaires were removed, a total of 628 questionnaires, 318 in the automotive industry and 310 in the communication industry, were evaluated. It should be noted that the questionnaire used for the research was created for the mentioned doctoral dissertation and the ethics committee approval was obtained (Atatürk University Legal Consultancy dated 05.02.2019 and no. 48553601-000-E.19000433.057).

4.2 Data collection tools: competitive intelligence scale and strategic thinking scale

When examining the literature, a scale for measuring managers' skills in competitive intelligence in Turkey had not been developed. Although a limited number of competitive intelligence surveys had been developed in the international literature, it was not possible to translate and use the scales exactly due to legal (radical differences in commercial and competition law) and cultural differences. Therefore, a competitive intelligence scale was developed by utilizing studies including Day and Wensley (1988), Dickson (1992), Sawka, Francis and Herring (1996), Hamel and Parahalad (1996), Li and Calantone (1998), Prescott (1999), Guimaraes (2000), Teo and Choo (2001), Qiu (2007), Saayman et al. (2008), Dishman and Calof (2008), Wright et al. (2013), the academic studies of Köseoğlu et al. (2015), Hall and Bensoussan's (2007) academic book and Dugal (1996), Hesford (1998), Grooms (2001) and Chen's (2012) doctoral dissertations. In the questionnaire form, the items measuring competitive intelligence take place in the first 45 places and consist of two main (and six sub) dimensions. These dimensions are the competitive intelligence context and the competitive intelligence process. Reliability analysis was conducted to determine the reliability of the competitive intelligence scale. According to analysis results, the correlation for any item is not lower than 0.30, which is taken as the cut-off point. For this reason, there is no need to remove any item related to the scale from the scale. Generally, the reliability coefficient for the scale is 0.973. Thus, the scale is considered to be reliable since this value is higher than 0.70 which is the acceptable limit for reliability.

This strategic thinking scale has been used before and has been adapted from highly valid expressions. Strategic thinking was examined in three sub-dimensions in the study. These are systems thinking, vision and creativity. The system thinking dimension consists of nine statements created by Pisapia et al. (2005) and Timuroğlu (2010). The vision dimension consists of nine statements created by Timuroğlu (2010) and Lahti (2003) and the creativity dimension consists of seven statements created by Timuroğlu (2010) and Murphy and Reed (1991). In order to investigate the reliability of the strategic thinking scale, the internal consistency of the 25-item scale was investigated at the first stage. Considering the items in the scale, it is observed that the total score correlation for any item is not lower than 0.30, which is accepted as the cut-off point. For this reason, at this stage, the analysis continued without removing any items from the scale. Generally, the Cronbach alpha coefficient of the scale was 0.960 as a result of reliability analysis and found reliable as well.

5. ANALYSIS AND FINDINGS

5.1 Factor analysis findings of scales

In the second stage of the reliability and validity analysis of the strategic thinking and competitive intelligence scales, a varimax rotation exploratory factor analysis was applied. As a result of the second-level factor analysis applied to the strategic thinking scale, a three-factor structure was obtained by removing one item from the scale. It was observed that the three dimensions obtained explained 61.759% of the total variance, KMO

(0.958) and the Barlett test was significant (p =.000) and the cronbach alpha value was 0.960. All fit index values of the structure (CMIN/DF: 4.77; GFI: 0.87; AGFI: 0.85; CFI: 0.98; NFI: 0.97; IFI: 0.98; RMSEA: 0.078) were determined to be at an acceptable level

The 28-item structure obtained as a result of the fifth-level exploratory factor analysis performed for the competitive intelligence scale was verified and a six-factor structure was obtained. The first three of the six factors refer to the scope of competitive intelligence, and the last three to the competitive intelligence process. It was observed that the obtained six sub-dimensions explained 62.220% of the total variance, KMO (0.943) and the Barlett test was significant (p =, 000) and the cronbach alpha value was 0.973. All fit index values of the structure (CMIN/DF: 3.74; GFI: 0.88; AGFI: 0.85; CFI: 0.98; NFI: 0.97; IFI: 0.98; RMSEA: 0.066) were determined to be at acceptable levels.

5.2 Hypothesis tests findings

In order to test the hypotheses that form the basis of the research and to determine the relationship between strategic thinking and competitive intelligence, a correlation analysis was performed on the data. Correlation coefficients and descriptive statistics showing the relationships between strategic thinking (system thinking, creativity, vision) and competitive intelligence (competition intelligence context and competitive intelligence process) are given in Table 1. Based on the findings it is seen that there is a positive and significant relationship between strategic thinking and competitive intelligence in general at the 99% confidence level.

A two-step regression analysis was conducted to determine the effect of strategic thinking and its dimensions on the competitive intelligence context, competitive intelligence process and competitive intelligence. In the first step, competitive intelligence context, competitive intelligence process and competitive intelligence are taken as dependent variables, and strategic thinking as an independent variable as a whole (sum of three factors). In the second step, the system thinking, creativity and vision factors that constitute strategic thinking are considered as independent variables, and the competitive intelligence context competitive intelligence process and competitive intelligence are taken as dependent variables. In terms of the reliability of the findings obtained in the regression analysis, the VIF and tolerance values of the independent variables were shown to determine whether there was a multi-linearity problem and it was revealed that these values showed that there was no multi-linearity between the independent variables. Detailed data on the findings are shown in Table 2.

First, the effect of strategic thinking on competitive intelligence context was examined. In the first step, strategic thinking as a whole has a significant effect (= 0.644; p <0.01) on the competitive intelligence context. By looking at these data, it can be said that H1 is supported. In the second step, the factors of strategic thinking (vision β = 0.320; p <0.01: system thinking β = 0.198; p <0.01 and creativity β = 0.196; p <0.01) have a significant effect on the competitive intelligence context and H1a, H1b, H1c are supported.

Table 1 Correlation analysis of variables and dimensions.

Variables	**$\bar{X}$**	**SS**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1-System Thinking	3.93	0.64	1						
2-Creativity	3.79	0.81	0.70**	1					
3-Vision	3.85	0.75	0.79**	0.74**	1				
4-Strategic Thinking	3.86	0.66	0.91**	0.87**	0.94**	1			
5-Competitive Intelligence Context	3.85	0.65	0.64**	0.58**	0.66**	0.70**	1		
6-Competitive Intelligence Process	3.83	0.67	0.70**	0.62**	0.71**	0.75**	0.80**	1	
7-Competitive Intelligence	3.84	0.63	0.68**	0.62**	0.70**	0.73**	0.95**	0.93**	1

Table 2 *The effect of strategic thinking and its factors on competitive intelligence, the competitive intelligence context and the competitive intelligence process.*

Factors	**Dependent variable**											
	Competitive Intelligence				**Competitive Intelligence Context**				**Competitive Intelligence Process**			
	β	**t**	**β**	**t**	**β**	**t**	**β**	**t**	**β**	**t**	**β**	**t**
Strategic Thinking	0.717**	25.761	-	-	0.644**	21.635	-	-	0.727**	26.509	-	-
System Thinking			0.266**	5.757			0.198**	3.941			0.338**	7.430
Creativity			0.182**	4.092			0.196**	4.055			0.140**	3.195
Vision			0.335**	6.766			0.320**	5.970			0.316**	6.507
Durbin Watson	1.367		1.368		1.447		1.447		1.433		1.437	
Tolerance			0.363; 0.391; 0.318				0.363; 0.391; 0.318				0.363; 0.391; 0.318	
VIF			2.756; 2.557; 3.145				2.756; 2.557; 3.145				2.756; 2.557; 3.145	
R^2	0.515		0.515		0.428		0.429		0.529		0.532	
Adjusted R^2	0.514		0.513		0.427		0.426		0.528		0.530	
F	663.614**		220.976**		468.062**		155.999**		702.702**		236.739**	

Second, the effect of strategic thinking on the competitive intelligence process was examined. In the first step, it is seen that strategic thinking as a whole has a significant effect (= 0.727; p <0.01) on the competitive intelligence process. Looking at these data, it can be said that H2 is supported. In the second step, the factors of strategic thinking (vision β = 0.316; p <0.01: system thinking β = 0.338; p <0.01 and creativity β = 0.140; p <0.01) have a significant effect on the competitive intelligence process and H2a, H2b, H2c are supported.

Finally, the effect of strategic thinking on competitive intelligence was examined. In the first step, it is seen that strategic thinking as a whole has a significant effect (β = 0.717; p <0.01) on competitive intelligence. According to these data, it can be said that H3 is supported. In the second step, the factors of strategic thinking (vision β = 0.335; p <0.01: system thinking β = 0.266; p <0.01 and creativity β = 0.182; p <0.01) have a significant effect on competitive intelligence and H3a, H3b, H3c are supported.

The results of the independent two-sample t-test performed in order to reveal whether the industry variable makes any difference in terms of strategic thinking and competitive intelligence are shown in Table 3. Based on the findings, the industry variable creates a significant difference (p <0.01) in terms of system thinking, vision and strategic thinking. Accordingly, it can be said that H4 is supported since the system thinking, vision and creativity scores of the participants working in the automotive industry are significantly higher than the scores of the participants working in the communication industry. On the other hand, it is seen that the industry variable creates a significant difference (p <0.01) in terms of the competitive intelligence context, competitive intelligence process, and competitive intelligence. Accordingly, it can be said that H5 is supported since the competitive intelligence context, competitive intelligence process, and competitive intelligence scores of the participants working in the communication industry are significantly higher than the scores of the participants working in the automotive industry.

6. CONCLUSION AND EVALUATION

This study was carried out to determine the effect of strategic thinking on competitive intelligence. In the literature review conducted for this purpose, it was seen that strategic thinking and factors affect competitive intelligence and its factors. For this reason, managers of the automotive and communication industries operating in the oligopoly market where the intensity of competition is high were selected as the sample and the effects of strategic thinking on the competitive intelligence were investigated by making an industrial comparison. For this purpose, by examining the strategic thinking and competitive intelligence models previously

developed in the literature, a research model was developed that reveals the relationship between strategic thinking and competitive intelligence. In line with the specified purposes, 628 executives operating in the automotive (318) and communication (310) industries were surveyed and the data obtained were evaluated and interpreted. It was possible to test the predictions for the purpose of the study by searching for answers to the research questions.

The first question in the research was if business managers think strategically in competitive sectors. In order to answer this question, the averages and frequency distributions of the statements in the strategic thinking scale were examined and the general average of 25 statements belonging to the strategic thinking scale was found to be 4.02. Accordingly, it can be said that the managers working in the automotive and communication industries have strategic thinking skills. Strategic thinking has been analyzed separately according to its factors. The general average of nine statements measuring system thinking, which is the first sub-dimension of strategic thinking, is 4.37, the general average of six statements measuring the creativity dimension is 3.78, and the general average of nine statements measuring the vision dimension is 3.84. The results obtained indicate that the managers exhibit system thinking, creativity and vision behaviors, but they exhibit system thinking skills at a higher rate than others. This situation can be explained by the fact that there are many factors that managers should consider, especially in industries with high competition intensity.

Strategy was born out of the need to defeat the enemy. It is not possible to talk about the existence of a strategy without enemies. When considered in terms of business activities, the existence of a strategy requires the existence of a competitive environment (Horwath, 2006: 3). According to Ohmae, strategy is the most important element that differs from other business plans. The strategy is to gain competitive advantage. Namely, no strategy will be needed in an environment where there is no opponent. For this reason, it will be possible to talk about the existence of the strategy if it provides a sustainable advantage against the rivals (Ohmae, 1983: 36). According to Chandler, strategy is the determination of the long-term main goals and objectives of an enterprise, allocating the necessary resources for these goals and objectives, and preparing appropriate action plans (Chandler, 1990: 13). In the literature, it is seen that the unshakable integrity between strategy and competition encourages business managers to gain strategic thinking skills beyond classical strategic plans.

Table 3 Findings regarding the strategic thinking and its factors with competitive intelligence, the competitive intelligence context and competitive intelligence process and in terms of industry variable. 1: One tail probability (right) 2: One-tail probability (left).

Factors	**Industry**	**N**	**Mean**	**Standard deviation**	**t**	**Significance level**
System Thinking	Automotive	318	3.99	0.56	2.01	**0.022**[1]
	Communication	310	3.86	0.71		
Creativity	Automotive	318	3.82	0.76	1.14	0.127[1]
	Communication	310	3.75	0.85		
Vision	Automotive	318	3.92	0.68	2.19	**0.015**[1]
	Communication	310	3.77	0.81		
Strategic Thinking	Automotive	318	3.92	0.58	1.82	**0.035**[1]
	Communication	310	3.80	0.73		
	Automotive	310	3.74	0.81		
CI Context	Communication	318	3.79	0.67	-2.23	**0.013**[2]
	Automotive	310	3.91	0.63		
	Communication	310	3.96	0.68		
CI Process	Automotive	318	3.77	0.70	-2.07	**0.020**[2]
	Communication	310	3.88	0.64		
Competitive Intelligence	Automotive	318	3.78	0.65	-2.37	**0.009**[2]
	Communication	310	3.90	0.60		

When the literature is examined, it is seen that the automotive and communication industries are experiencing intense competition in the current century, and strategy and competition are the most fundamental dynamics of the industry. Rubenstein (2001) drew attention to the speed and extent of the transformation in the automotive industry, stating that in 1900 there were 2000 motor vehicles and 20,000 registered horses in the USA, and by 2000 the number of motor vehicles became more than the people with motor vehicle licenses. Shimokawa (2010), on the other hand, stated that the automobile industry in developed countries has at least ten percent of the gross national product, and therefore the automobile industry has reached the most important threshold in the history of the industry in the 21st century. Developments in the history of the communication industry parallel those of the automotive industry. From an industry structure that was almost without competition with the monopoly and mandatory regulations of the states before 1980, the transition led to a new identity, where the intensity of competition reached a very high level over the last quarter century (Trauth and Pitt, 1992).

Factors such as globalization, mass production speed, increasing market share, innovations in information and communication technologies, changing game rules with new actors in industries, and speed of environmental change push companies to be more innovative and future-oriented, although there are many other components that they should consider. Mintzberg et al. (2005) stated that the basic acceptance of strategy is that the actual situation experienced between the two actors in the market is called competition, and the ability to always remember that the competitors can do things better or differently, which is called strategic thinking skill. Therefore, in parallel with these explanations, it has been determined that the managers of the automotive and communication industries express their system thinking, creativity and vision skills.

The second question of the research is if business managers in competitive sectors attach importance to the competitive environment and competitor analysis. In order to answer this question, the averages and frequency distributions of the expressions in the competitive intelligence scale were examined. The general average of 28 expressions measuring competitive intelligence was 3.83. Dimensions of competitive intelligence activities of managers were evaluated separately. The general average of 17 expressions measuring competitive intelligence context was 3.85 and the general average of 11 expressions measuring the competitive intelligence process was 3.83. Accordingly, it can be said that the automotive and communication industry executives who constitute the research sample attach acceptable level of importance to competitive intelligence activities.

Competition is a phenomenon related to the past, present and future of the business. Competition is the ability of a business to adapt its activities to the process of change occurring locally, nationally and globally in order to develop, grow, renew and even maintain its current status (Kök and Deliktaş, 2003: 17). In other words, competition is the ability of an enterprise to make more profit than other actors in the market or to realize all these in a sustainable order, beyond the longer survival. In this context, competitive intelligence predicts that businesses take three basic steps behaviorally: obtaining information about the competitor, interpreting and adapting (Li, and Calantone, 1998: 16). The information depicted here represents an indispensable resource and an economic value placed on the table of strategic decision makers in a processed form, beyond information obtained from any source. In other words, the information obtained through the activities of competitive intelligence guides the competitive position of the enterprise as well as the pioneer and guide of the innovation activities of the enterprise.

It should be noted that the information age creates changes in the roles and responsibilities of managers. Until a quarter century ago, perhaps the most fundamental problem of a manager was to make decisions under environmental uncertainty, while activities such as competitive intelligence make decision-making processes relatively easier. However, as an innovation created by the information age, managers who are in decision-making positions have to carefully create the information line that will affect their decisions (Poali-Scarbonch and Guenec, 2011: 208). Since the process that continues from the acquisition of data to its return to information is the precursor of the strategic decisions that will shape the future of the enterprises, it

obliges the information to be obtained in a systematic order and through a healthy filter.

Another common feature of the automotive and communication industries, along with their intense competition, is that the innovation and competition activities in the industries move from the top to the bottom on a vertical plane. In other words, the competitive moves of the administrative and sales units in both industries are limited. Regional and provincial directorates, dealers and sales representatives cannot go beyond the competition policies determined by the senior management or the brand executive board. However, this does not mean that competition is lacking in practice. The determining factor for both industries is that price competition is determined within the strategic plan of the senior management. In competitive moves other than price competition, dealers have a limited range of action, though. The important factor for top management is that the flow of information moves from bottom to top. In other words, in both industries, the most basic information that will guide strategic decisions is created with the data obtained from customers. Because in both industries, the substitution of the final product is available, albeit limited, so customer satisfaction must be provided at the highest level. Additionally, in both industries, the customer is not only the purchaser of the product, but also the first feedback provider on the product. In this sense, the feedback to be obtained from the customers and the information to be obtained about the industry through the customers should be processed in a systematic order and reported to the senior management. All these requirements are possible with either a formal competition intelligence unit or a formal knowledge management system.

According to the results of the analysis conducted on whether the industry variable has made any difference in terms of strategic thinking and competitive intelligence, the system thinking, vision and creativity scores of the participants working in the automotive industry are significantly higher than the scores of the participants working in the communication industry. The fact that competition in the automotive industry is widespread on a global scale and that there are many more components that managers must consider compared to the communication industry explains the results.

In addition, it is observed that the scores of participants working in the communication industry on the competitive intelligence context of the competitive intelligence process have significantly higher scores than the participants working in the automotive industry. The communication industry is an industry with sharp and intense price competition compared to the automotive industry. Again, compared to the automotive industry, although it is not easy to enter the industry, the services offered take a lower place in the customer budget, facilitating customer permeability in the market. In this sense, the high average of competitive intelligence and factors in the communication industry is due to the natural conditions of the industry and is in harmony with the real conditions of the industry.

This study shows that strategic thinking affects competitive intelligence in competitive industries. Business managers must realize that we are living in the information age. While knowledge is a bridge between land, labor force, capital and entrepreneurs, which are accepted as basic production factors in one aspect, it is now the fifth production factor in our age with another aspect. In this sense, although strategic planning maintains its importance, it no longer has an effect that will provide strategic superiority to businesses. The distinguishing feature that will make a good strategic plan better is not the power of the text but the mental power that makes the planning. For this reason, managers who have strategic thinking skills need information in order to interpret the dynamics of competition correctly, to predict their competitive positions and to determine their competitive positions correctly. Knowledge is everywhere: countless and dynamic. For this reason, information that will reach business managers through only a filter will be useful. Strategic thinking skill comes into play at this point. It is the business manager who has strategic thinking skills, who will determine which data to focus on and who will be involved in the process from among the infinite data whose location, time and form are unknown. This will be a tool that starts with the mental process and turns into a final output with the help of information management systems, which will provide a competitive advantage to the business.

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Competitive intelligence as a factor of the innovation capability in Mexican companies: A structural equations modeling approach

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ABSTRACT In today's world markets, where rivalry is increasingly intense, companies face pressure to deliver better results in a shorter time. The continual technological change produces more efficient equipment, processes and products, new business relationships due to emerging and unexpected substitute products, as well as changing consumer preferences. In this constantly changing environment, companies need useful information to develop strategies, make decisions and implement them throughout the organization to increase their competitiveness and market share. This is not easy or straightforward, it begins at the company's strategy level and ends with the creation, development, and deployment of the technological capabilities necessary to provide agile and flexible responses to customers, market situations, and technological changes. The innovation capability of companies plays an important role, as it is a critical strength, technology-based and strategic in nature, with the purpose of creating and developing new products and improved processes. This is a continuous source of competitive advantage, and a necessary element for companies that operate in highly competitive environments and under growing rivalry, in order to improve technological innovations and developments. This information is essential for decision-making and one way to generate it is through methodologies, among which competitive intelligence stands out. This article presents an investigation using a structural equation modeling methodology to evaluate the relationships between competitive intelligence and innovation capability of Mexican companies. The empirical results show that competitive intelligence has an important indirect impact on three main functions of innovation capability: creation of new concepts, innovation and technological development, and development/improvement of ideas for products, processes, and equipment. The indirect effect is through knowledge management as a mediating factor.

KEYWORDS Competitive intelligence, innovation capability, structural equations modeling

1. INTRODUCTION

Business environments are characterized by their high volatility, turbulence and uncertainty. Some industries pose extreme dynamism, under increasing rivalry the emergence of technologies are the source of important disruptions. In such conditions, analysis and decision making are highly complex. Therefore, making the right decision depends on the analysis of the available information. But this is just the first problem, collecting data and producing useful information, adequately and on time, are difficult tasks. Nonetheless, the processes for data collection, and information and knowledge management, are not as effective as needed. This is even though it is clear that companies

do not take advantage of the knowledge obtained by their experience, nor do they track environmental and competitiveness variables. In the search for explanations, the theory related to knowledge is developed in three fields of knowledge: competitive intelligence (CI), knowledge management (KM), and intellectual capital (IC).

CI is a process or practice that produces and disseminates actionable intelligence by planning, collecting, processing and ethical and legal analysis of the internal and external or competitive environment, in order to assist decision makers and to provide a competitive advantage to the company (Pellissier and Nenzhelele, 2013). Application of CI has increased in the last decades and it has become more formalized (Sewdass & Calof, 2020). CI is defined as a systematic effort with specific, ethical and timely objectives for the gathering, analysis and synthesis of relevant information regarding competitors, markets and the economic environment, which also constitute a good source of competitive advantage (Fleisher, 2009; Rodríguez & Chávez, 2011). This information leads to better business planning, including research, marketing and development projects. CI is a common practice because of the importance of tracking technology trends, the reduction of associated risks and the acquisition of the right technologies (Brody, 2008; Fuld, 2006).

KM research shows how the important role of good knowledge management contributes significantly to improving organizational performance (Sundiman, 2018). It has an utmost interest for information and business management, communication, industrial engineering, and psychology because of the contributions to the organization (Rodríguez Gómez, 2006). Among other functions, KM is dedicated to the development of the capabilities and activities required for the design and improvement of goods, process, and production technologies (Díaz, 2007). Two of the most important sources of competitive advantage are the knowledge and the capabilities to learn and execute plans.

IC can be defined as the sum of all of the intangible and knowledge-related resources that an organization is able to use in its production processes in the attempt to create value (Lerro et al., 2014). It is the set of intangible assets that, when well-managed, can be a source of sustainable competitive advantages. It is useful knowledge for the creation of value and increased profitability (Alama et al., 2006). IC has three widely accepted elements: human capital integrates attitudes, abilities, experiences of the people; structural capital includes intellectual property, such as patents, results of research and development, policies, strategies, and information, closely related to innovation capability; and relational capital deals with the value of the business relations with its environment, such as customers and suppliers (Hormiga et al., 2011; Díez et al., 2010).

Innovation capability (InC) is a firms' fundamental strategic asset to sustain competitive advantage (Ponta et al., 2020). It is the ability to continuously transform knowledge and ideas into new products, process, and system for the benefit of the firm, and is a set of organizational capabilities and resources. These are highly dynamic in nature with the purpose of managing and deploying innovation strategies, searching for the creation and development of the sustainable competitive advantage required for adequate and flexible responses to market challenges. Robledo et al (2010) includes the people abilities and their best organization (Lugones et al., 2007) in this as well.

Although the purposes and the specific study are different, the factors that explain the creation and development of innovation capacities could be affirmed that they are common, but their relative importance is not conclusive. As for CI, it is less frequently applied because it is a newer field and its strategic focus and more specialized functions reduce the widespread use. Still, it is considered an important task because it has a great effect on the economic environment. This is because it has a continuous flow of innovations and technological developments that exert pressure on all competitors, driving innovation throughout the system (Fagerberg & Srholec, 2008).

This article presents an evaluation of structural relationships between CI, KM, and IC as influencing factors of InC of Mexican companies established in Torreon city, located in Northeast Mexico. The economy of the region is based on agricultural, textile, metallurgical, chemical, commerce, and services industries. The sector of maquiladoras, international companies, is devoted to textile, electronics, and automotive production.

Similar research was done in 2018 in companies from the Juarez city, Mexico-El Paso, Texas, USA, region (Poblano et al, 2019). Ciudad Juárez is an industrial city in northern

Mexico on the banks of the Rio Grande, and it is the largest city in the state of Chihuahua. It has an economy based on the manufacturing industry made up of more than 380 companies, which are located strategically at border bridges and in fast access areas.

Bases on the review of related studies, the hypotheses to be tested empirically are:

H_1: Competitive intelligence influences the innovation capability,

H_2: Competitive intelligence influences knowledge management,

H_3: Knowledge management influences innovation capability.

The factors are discriminated by their impact on innovation capabilities through structural equation modeling (SEM), so that companies can benefit from the knowledge of their current state and the possible measures for improvement.

Statistical analyses begin with the identification of outliers using the Mahalanobis distance method. The internal reliability of the questionnaire, the Kaiser-Meyer Olkin test, is measured for the suitability of the sample, and Bartlett's sphericity test for the correlations to determine the suitability of the model. Subsequently the regression weights and factor correlations are determined by means of the principal components extraction method and the rotation is performed by Promax. Then the convergent and discriminant validation is carried out, as well as the estimation of the adjustment indices for the validation of the questionnaire constructs.

The SEM uses a confirmatory approach for the analysis of theories that present relationships between observed variables (items) and latent variables or factors. Byrne (2010) begins with the specification of the model. For the specification of the model, Lomax & Schumacker (2012) recommend the definition of relationships with the variables of the theoretical model and for the determination of the best model, capable of producing the sample covariance matrix. To determine the differences between the real model and the data, all the parameters are considered free, restricted, or fixed and by their combination, the implicit variance-covariance matrix of the model is constructed. This is followed by identification, estimation, testing, and modification (Lomax & Schumacker, 2012). Statistical analyses were performed with Minitab v17, SPSSv.22, and Amos v.22.

Table 1 Dimensions and their critical factors.

Dimension	Critical Factors	Item Code	References
Competitive Intelligence	CI activity planning The collection of environmental information The analysis of information to generate intelligence, The administration of useful information (intelligence), Decision-making based on intelligence, CI staff talent management.	CI01, CI02, CI03, CI04, CI05, CI06, CI07	Stefanikova et al. (2015); Dishman y Calof (2008); Rodríguez y Tello (2012); Fleisher (2009); Nenzhelele (2014); Calof, (2014); Peyrot et al. (2002).
Knowledge Management	Information system, Human factor management, Employee empowerment, Organizational structure, Knowledge sharing.	KM01, KM02, KM03, KM04, KM05	Salojärvi et al. (2005); Ghannay et al. (2012); du Plessis (2007; Tzortzaki y Mihiotis (2014); Martins et al. (2003).
Intellectual Capital	HC: Professional level, Training and development, Attitude to share knowledge; SC: Information System, Staff participation, Ability to innovate; RC: Relationship with customers and suppliers, Strategic Alliances, Relationship with organisms (public & private).	IC01, IC02, IC03, IC04, IC05, IC06 IC07, IC08, IC09	Díez et al. (2010); Díaz (2007); Sveiby (2001); Boekestein (2006); Santos-Rodríguez et al. (2011); Huang et al. (2010); Kianto et al. (2017).
Innovation Capability	Generation of ideas, Generation of new concepts, Generation of new products, Generation of new processes, Intellectual property.	InC01, InC02 InC03, InC04 InC05	Robledo et al. (2010); Lugones et al. (2007); Güemes y Rodríguez (2007); Dodgson et al. (2008); Tidd y Bessant (2009).

Table 2 Sample characteristics (n=195).

Characteristics	Frequency	Percentage	Accumulative %
Gender			
Male	148	75.8	75.8
Female	47	24.2	100.0
Age			
Less than 25	76	38.9	38.9
Range 25 - 35	65	33.4	72.3
Older than > 35	54	27.7	100.0
Experience in related position			
< 1	77	39.5	39,5
2 - 7	55	28.2	67.7
> 7	63	32.3	100.0

2. METHODS AND DISCUSSION

The methodology has a quantitative focus, used data gathered and statistical analyses to test hypotheses and obtain an enhanced understanding of the phenomena (Malhotra, 2008; Hernández et al., 2014). The scope was correlational with the purpose of determining the relation between two or more factors and variables in their specific context. The design was non-experimental and transversal, correlational-causal, collecting data in a single trial (Hernández et al., 2014).

In the literature review of the four dimensions (latent variables), the most frequent critical factors mentioned were selected, subsequently, for each of the factors. Items were established for their measurement, yielding a set of 26 items for IC, KM, IC and InC (Table 1). Data collection was carried out through a questionnaire, which was previously validated in content, reliability, and construct (Poblano Ojinaga, 2019).

The questionnaire used five Likert scale categories, ranging from 1, which means "strongly disagree" to 5, "strongly agree". The sample size was 195, Table 2 presents its demographic characteristics.

The collection of sample data was carried out through non-probabilistic convenience sampling. The sample elements were selected because they were determined through a census and willingness to participate (Malhotra, 2008). The questionnaire was given

Table 3 Sample correlation matrix for data (n = 167).

	CI01	CI02	CI03	CI04	CI05	CI06	CI07	KM01	KM02	KM03	KM04	KM05	In01	InC02	InC03	InC04	InC05
CI01	1.000																
CI02	.694	1.000															
CI03	.530	.667	1.000														
CI04	.430	.492	.733	1.000													
CI05	.419	.549	.592	.684	1.000												
CI06	.403	.523	.652	.587	.600	1.000											
CI07	.494	.513	.536	.491	.502	.650	1.000										
KM01	.351	.398	.453	.377	.407	.524	.432	1.000									
KM02	.282	.285	.296	.285	.336	.357	.471	.473	1.000								
KM03	.306	.433	.419	.410	.419	.433	.462	.379	.520	1.000							
KM04	.288	.360	.414	.400	.429	.423	.449	.384	.331	.470	1.000						
KM05	.261	.367	.494	.492	.461	.483	.409	.435	.370	.446	.598	1.000					
InC01	.220	.345	.331	.246	.251	.269	.229	.299	.248	.340	.537	.413	1.000				
InC02	.141	.297	.313	.277	.304	.287	.183	.338	.126	.288	.490	.376	.710	1.000			
InC03	.049	.156	.265	.208	.124	.273	.149	.188	.151	.233	.249	.284	.407	.585	1.000		
InC04	.073	.188	.275	.269	.193	.288	.244	.194	.245	.315	.307	.378	.405	.464	.522	1.000	
InC05	.025	.172	.206	.146	.067	.222	.164	.093	.053	.248	.232	.281	.274	.401	.479	.401	1.000
s.d	0.567	0.522	0.523	0.522	0.511	0.545	0.521	0.553	0.536	0.504	0.589	0.556	0.580	0.570	0.666	0.569	0.861
means	4.545	4.449	4.383	4.449	4.449	4.377	4.371	4.425	4.503	4.401	4.341	4.377	4.395	4.257	4.120	4.210	3.868

Table 4 Convergent validity.

DIMENSION		Factor Loading	AVE	CR	Cronbach's Alpha
Competitiva Intelligence					
Item	CI01	.731			
	CI02	.822			
	CI03	.869			
	CI04	.806			
	CI05	.781			
	CI06	.775			
	CI07	.707	**0.62**	**0.92**	**0.90**
Knowledge Management					
Item	KM01	.695			
	KM02	.815			
	KM03	.748			
	KM04	.680			
	KM05	.679	**0.53**	**0.85**	**0.80**
Innovation Capability					
Item	InC01	.732			
	InC02	.842			
	InC03	.783			
	InC04	.715			
	InC05	.666	**0.56**	**0.86**	**0.80**

to 195 people (Managers and supervisors) from 14 multinational companies that produce auto parts, textiles and electronics (Lloret-Segura et al., 2014).

The Mahalanobis Distance method eliminated 28 questionnaires. Using the remaining 167 questionnaires, the Cronbach alpha gave a 0.91, indicating it is reliable (Tavakol & Dennick, 2011). The Kaiser-Meyer-Olkin test gave 0.880, indicating low partial correlations, measuring as a common factor. Chi-Square = 1466.491, DF = 136, and a p-value = 0.000 meaning that the correlations matrix is not an identity one, with high correlations, which is acceptable (Levy et al., 2003).

In the initial factorial analysis, the IC was eliminated because the items do not comply with the convergent validity criteria, although in the literature report an impact of intellectual capital on competitive intelligence (Santos-Rodrigues, 2011; Wang y Chen, 2013; Sivalogathasan & Wu, 2013). A correlation matrix of the data are presented in Table 3.

Table 5 Discriminant validity.

	CI	InC	KM
CI	**0.62**		
InC	0.16	**0.56**	
KM	0.39	0.21	**0.53**

The correlations and factor loading (FL) were determined using the principal axes method to extract the factors and the Promax method for their rotation. The FL indicates the correlation between the factor and the variable, observing that for all the items it was greater than 0.60, exceeding the recommended level (Lin, 2007). Convergent and discriminant validity was measured with the above information. Convergent validity is the degree to which multiple attempts to measure the same concept agree (Table 4). The composite reliability values (CR) show the degree to which the indicators explain the latent construct, where values in a range of 0.85 to 0.92 were obtained. In all cases this exceeded the recommended level of 0.70. Likewise, the average variances extracted (AVE) reflected the total amount of variation in the indicators, explained by the latent construct. Values ranged between 0.53 and 0.62, exceeding the recommended level of 0.5 (Lin, 2007).

Discriminant validity is the degree to which the measures of the concepts are different, for which the squared correlations of the construct are compared between the mean variance extracted for the construct. Discriminant validity occurs when the elements on the

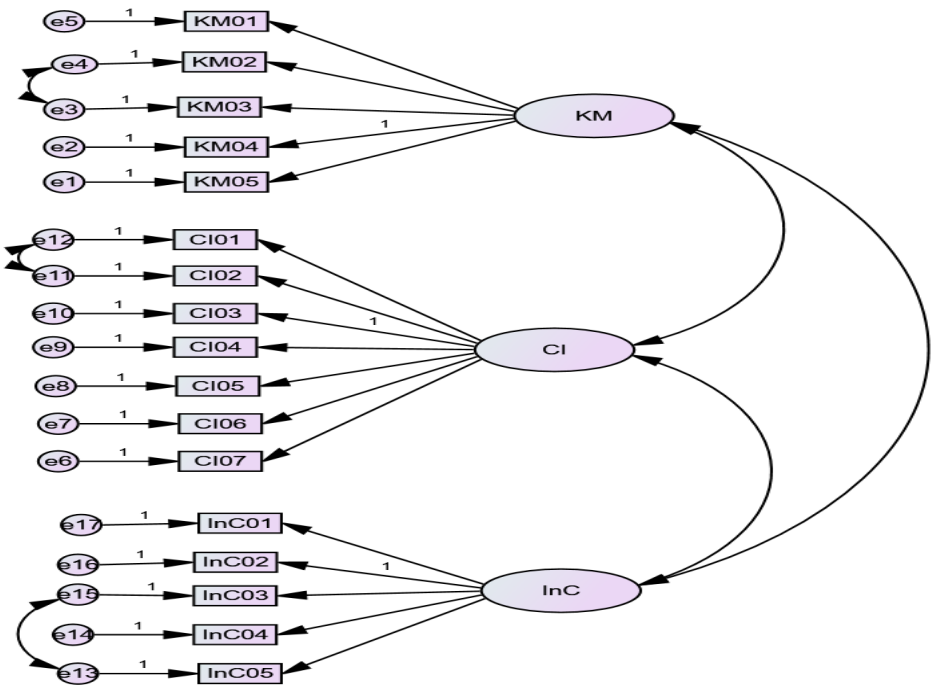

Figure 1 Measurement model of CI, KM and InC.

diagonal (AVE) are greater than the elements below the diagonal (Matzler & Renzl, 2006). The results show that the square correlations for each construct are less than the mean variance extracted (Table 5).

The analyses show that the results met the criteria of convergent and discriminatory validity. Therefore, the confirmatory factor analysis (CFA) was carried out with the three factors and their 17 corresponding items (Figure 1). The CFA results for the measurement model show a Chi-square = 224.274, p-value = 0.000 and CMIN / DF = 1.985 value less than the recommended value of 3. Given AGFI = 0.82, greater than 0.80; the comparative adjustment index, CFI = 0.92, is higher than the recommended 0.9 (Chau & Hu, 2001). The root of the mean square error of approximation, RMSEA = 0.077, was less than the proposed 0.08 limit (Browne & Cudeck, 1993), and since the variance-covariance data fit the structural model well, the construct is valid.

The hypothetical model has three latent variables (or factors) and 17 observed variables (items). It shows three structural relationships: competitive intelligence influences innovation capability (H1); competitive intelligence influences knowledge management (H2) and knowledge management influences innovation capability (H3).

For the model identification, the number of free parameters to estimate must be equal to or less than the number of different values in the matrix S. Since the number of estimated values (153) was greater than the number of free parameters, the model was identified and the estimation of the parameters followed.

For the estimation of the parameter, the regression weights and the structural coefficients of the hypothetical model indicate that, with the exception of the IC - InC, they were significant because the p-value was less than $\alpha = 0.05$. This was run with AMOS v.22 with a maximum likelihood method for normally distributed, ordinal, or moderately abnormal data. For the model test, given the set of fit indices used and the values presented in Table 3, the degree to which the variance-covariance data fit the hypothetical structural model was acceptable. The fit seemed reasonable, although modification could improve the model fit.

For modifying the model to improve its fit, additional parameters were included such as modification indices, with three covariances between errors, e3-e4, e11-e12, and e13-e15. In the maximum likelihood method, the factorial loads are statistically significant, different from 0.00 ($p < 0.05$), except for the path between competitive intelligence and innovation capability. Furthermore, given that Chi-square = 224.74, the p-value = 0.000 and CMIN / DF; AGFI; RMSEA, meet the corresponding criteria, presented in Table 6.

Finally, Figure 2 presents the hypothetical structural model, which shows three factors

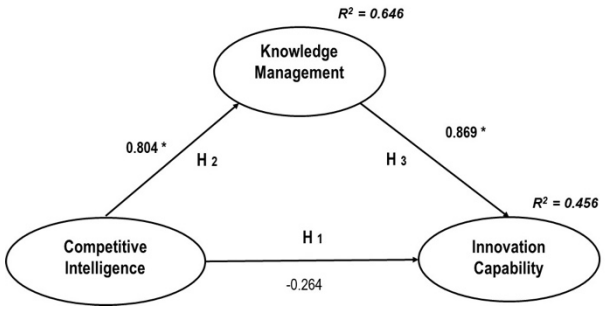

Figure 2 Hypothetical structural model (Pv < 0.001*).

with their structural coefficients and the SMC (R2) for the endogenous variables KM and InC. Assuming that the estimates are an effect of the latent variables of the three hypotheses raised in the study, H2 and H3 have significant structural coefficients, which indicate that there is enough evidence to accept that CI influences KM, and KM also has an influence on the InC.

CI has a positive effect on KM, and the latter has a positive effect on the InC, results coinciding with Sundiman, (2018) and Le & Lei (2019). There is also evidence that the real effect is enhanced with careful KM (de Almeida et al., 2016)

In addition, H1 is rejected for not having sufficient statistical evidence that CI has a significant direct effect on the InC in Mexican companies. In this case, the empirical results coincide with those reported by Güemes & Rodríguez (2007) that CI activities are not formally carried out in Mexican companies to improve the innovation of products and services. Poblano et al., (2019) report the same in plants located in Ciudad Juárez, Mexico, mainly because IC is still a relatively young discipline (Alnoukari Hanano, 2017) in most Mexican companies.

However, although there is no direct effect of CI on InC, there is a significant indirect effect through KM (Table 7). This means that it becomes the mediating variable between CI and InC. These results support the importance of integrating KM and CI with the intention of obtaining better results and being a source of competitive advantage for companies (Dhujahat et al., 2017; Sundiman, 2018; Sharp, 2008; González- Gutiérrez, 2011; Rothberg and Erickson, 2013).

On the other hand, when analyzing the results of the total direct and indirect effects, high values are observed in the indirect effects, with the value of 0.698 between CI and InC. Table 7 presents the standardized effects between factors and the corresponding regression weights. The indirect effects (estimated with the bootstrap method) come from the use of CI and KM practices.

CI has a significant impact on three functions of KM: the activities for the shared use of knowledge and the learning obtained by experience (KM05, 0.600); the system for the management of innovation- (KM04, 0.588); and the measures taken for people empowerment (KM03, 0.507). Also an important indirect impact of CI on InC is observed in three functions. The production of new concepts (InC02, 0.384); analysis and decision making for innovation and technology development (InC01, 0.339); and on the development and improvement, ideas for products, processes and equipment (InC03, 0.276). These effects were statistically significant at a level of 0.05

Finally, the factor loadings indicate a high correlation between CI and InC, specifically, of the CI factors. The ones with the greatest impact are the collection and analysis of information from the environment, formally and systematically, for strategy purposes.

3. CONCLUSIONS

Although IC was discarded and a relationship with InC couldn't be verified, the contents of the former and reports in the literature indicate there has to be a direct effect, mainly with relational capital. This has a close relation with CI, since people have to have a deep understanding of the competitive environment, strategy formulation and deployment, and the management of knowledge. A relationship of structural capital with innovation is also observed, although it might be explained by the management of research and development, intellectual property such as patents and the learning obtained by experience. This focus also might explain the elimination of IC. For the people interviewed, there was no evident relation of its theoretical contents with innovation.

Table 6 Fit indexes of the measurement model.

Fit Index	Chi-square	DF	CMIN/DF	CFI	RMSEA	AGFI
Initial Model	290.264	116	2.502	0.875	0.095	0.77
Modified Model	224.74	113	1.985	0.920	0.77	0.817
Criteria			<3.0	>0.90	< 0.08	>0.80

Table 7 Standardized total, direct and indirect effects.

Relationship	Total Effects	Direct Effects	Indirect Effect
CI -- KM	**0.804**	0.804	0
CI -- InC	0.434	-0.264	**0.698**
KM -- InC	**0.869**	0.869	0

It seems that a formal integration of CI and KM and the description of the mediating effect of CI on InC is pertinent. This opens another research possible for the development of a system tracking competition variables such as emergent products and technologies and competitiveness, and feed them in an effective way to the functions that use them, such as design, engineering, marketing. The characterization of the indirect effects of CI on InC is also important. This could be through KM as an intermediate variable (mediator), which helps to explain how or why an independent variable influences a result (Glunzler et al., 2013). This assumption needs to be verified, including the mediating effect to gain a better comprehension of this phenomena. In this sense, it is suggested that future studies may consider the use of analytical and statistical methods to test relationships and measure IC practices, and move towards causals models (Calof & Sewdass, 2020), such as SEM which has proven to be a powerful tool for this purpose.

Likewise, these results may justify continuing with studies that evaluate the effect of CI on the InC of organizations considering the possibility of including a greater number of measurable variables than those considered in this study for the latent variables analyzed. However, in studies where a wide variety of variables are used only some of the CI measures had statistically significant correlations greater than .30, and it may not be enough to advance in the theory. Still, this could indicate that looking for a midpoint in the number of variables would be adequate. Even so, these studies indicate that further research in this direction is needed.

Table 8 Standardized indirect effects.

Variable	Competitive Intelligence	Knowlege Management
KM	0.000	0.000
InC	**0.698**	0.000
InC01	0.339	0.678
InC02	0.384	0.767
InC03	0.276	0.552
InC04	0.249	0.498
InC05	0.195	0.390
KM01	0.495	0.000
KM02	0.405	0.000
KM03	0.507	0.000
KM04	0.588	0.000
KM05	0.600	0.000

This paper constitutes evidence that SEM is a powerful tool for the determination of total or partial effects, direct or indirect, between a measurable variable and a latent variable, as in the effects between latent variables or constructs.

4. FUTURE RESEARCH

Although the main limitation of the study is the size of the sample, several aspects indicate that the study is still valid. These include the internal consistency of the questionnaire (Cronbach's Alpha) and KMO greater than the recommended of .70; compliance with cases of convergent validity and discriminant validity; and compliance with the model fit criteria.

On the other hand, to validate and generalize the results obtained, it is necessary to carry out the study with a larger sample of Mexican companies. It could also be a line of research to compare the results obtained from Mexican companies with transnational exporting companies located in Mexico.

The study of the effect of CI on InC, through the mediating effect of KM, in organizations that have developed an efficient system, raises another possible line of research

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