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Stevan Dedijer
1911-2004

Some personal reflections on 11 years of JISIB editorial notes and production

For now, this is the last issue of JISIB. The reason is that funding for Open-Source journals through NOS-HS has been halted for all journals ending in 2022. JISIB had financing through 2021. There may be a revival of Open-Source initiatives and then it's possible to continue if we can obtain the funds, but for now JISIB will be put on pause.

JISIB came out regularly between 2011-2022, so for 11 years. For eight of these years the journal received funding from VR and NOS-HS. NOS-HS is the Joint Committee for Nordic Research Councils in the Humanities and Social Sciences. It's a cooperation between the research councils in Denmark, Finland, Iceland, Norway and Sweden responsible for research within the Humanities and Social Sciences. We are very grateful for continuous support received from NOS-HS. It has been instrumental for the advancement of Open-Source Publishing in Sweden.

The journal was started at a time when the interest for competitive intelligence (CI) was declining, during the first decade of the 21st century. Bibliometric analysis shows that JISIB has been the primary outlet for scientific articles on CI for the past decade. Most articles have been in the border between CI and business intelligence, or more specifically between software and web-solutions, web-intelligence, and social media intelligence. Some articles have been in market intelligence and other closely related areas. In France there has been a continuous interest for "intelligence economique" and in Sweden "omvärldsanalys". We have also seen new areas emerge and some areas increase in popularity, like collective intelligence, foresight and insight (competitive and market insight). However, the core of the content is much the same despite this relabeling. It's still about processes for providing decision makers with need-to-know information.

At the beginning, the editorial note basically just presented the content of the issues. As such, the first editorial note written was a general introduction and a welcome to the new journal (Vol 1, No 1, 2011). The second editorial note speaks of the importance of Open Access journals for the free and equal advancement of science to people around the world (Vol 2, No 1, 2012). We could have gone with private publisher too, but a majority of the editors were convinced that it was important for science to be free and easily accessible and that this was the future. We still believe so. In the third editorial note (Vol 2, No 2, 2012) the focus was on different CI conferences as contributors and sources of articles for the journal. The journal has always relied on these conferences for good and relevant content. The next editorial note is on the journal being indexed by EBSCO, and applying to get indexed by others, first Web of Science (Vol 2, No 3, 2012). The early days of the journal focused on reviewing what had already been done. Typical of this was my article "An overview of articles on Competitive Intelligence in JCIM and CIR" in that issue. This was also a time when I was able to work closely with my old mentor Per Jenster from CBS. We published "The relationship between Strategic Planning and Company Performance – A Chinese perspective" as a result of Per having moved to China and working at CEIBS.

The sixth issue of JISIB featured articles by prolific contributors such as A.S.A. du Toit and Sheila Wright (Vol 3, No 2, 2013). Many contributions in the next issue came from the 2013 SCIP conference in South Africa under the leadership of A.S.A. du Toit, the journal's editor for Africa (Vol 3, No 3, 2013). In 2014 we were indexed by SCOPUS and this was noted in the first editorial note of 2014 (Vol 4, No 1, 2014). In the next issue I published a so called spot-check, a market survey to see what readers and users prefer to see as content. Much of the challenge in theory is often to align the reality of intelligence with theory, to make sure they follow each other and are in sync. If not, theory tends to become irrelevant. This resulted in "A survey of users' perspectives and preferences as to the value of JISIB - a spot-check" (Vol 4, No 2, 2014). The last issue of 2014 presented some case studies, a gap that had been identified in the spot-check in the previous issue. This last year Jonathan Calof and I had been working with SAP to try to write some large cases on intelligence studies, but it will probably take another year or so before we know the results.

The first issue of 2015 presented papers from two conferences (Vol 5, No 1, 2015). The second issue presents articles from the ECKM 2015 conference. Vol 5, No 3 marks a landmark as this is the first issue after the design facelift made possible with the NOS-HS grant (Vol 5, No 3, 2015). The editorial note presents some self-reflection on intelligence studies as a discipline. My article is entitled: "A place for intelligence studies as a scientific discipline". In the next issue I take one step further with "A research agenda for intelligence studies in business". The next issue, No 2, is on user perspectives on business intelligence. My own contribution here is: "Users' perceptions of Data as a Service (DaaS)". I was never a tech guy so could not make many contributions in this area. Instead, I have written numerous articles on the user perspective, related to marketing and customers' expectations. My latest contribution there was published last year on how households look at Central Bank Digital Currencies: "Household acceptance of central bank digital currency: the role of institutional trust". For the last issue of 2016 I did an update of the problem studied in my doctoral dissertation on industrial espionage: "Economic and industrial espionage at the start of the 21st century – Status quaestionis". In the first issue of 2017 I tried to gather my ideas about how intelligence is related to geopolitics and founded in biology. It was based on the ideas expressed in my book "Geoeconomics". The article is entitled "Why the social sciences should be based in evolutionary theory: the example of geoeconomics and intelligence studies". It summarizes the way I still teach intelligence studies in Sweden today under the Swedish term "omvärldsanalys". I have given this course for 20 years now, first at BTH then later in Halmstad, and as a guest lecture at other universities. In the second issue of 2017 I revisited a favorite company: Ericsson, this time doing a comparative case study with another major Swedish company, SCA: "Why care about competitive intelligence and market intelligence? The case of Ericsson and the Swedish Cellulose Company". Among a series of conclusion, the article shows a major obstacle to good and well-functioning intelligence organizations: the all-knowing manager. Many managers simply do not listen to good intelligence because they think they know best. The issue deals with "How companies work and fail to work with business intelligence", as the editorial note suggests (Vol 7, No 2, 2017). No 3, 2017 has an even closer look at the implementation of new technology, as in the editorial note title: "How companies succeed and fail to succeed with the implementation of intelligence systems". Our article in that issue is called "The perception of useful information derived from Twitter: A survey of professionals" and shows that a large majority of managers find Twitter useful, but only half think that those who tweet have useful things to say. "It may be that intelligence professionals can find valuable information about markets, industries, and products without the person tweeting having any valuable information:

> "It may also be that 'the value of the information lies in the things that are not said. (…) Intelligence professionals know that corporate tweets come from communication departments and professionals. They may know how to read what they see or what is between the lines, so to speak. In that lays the valuable information' However user of Twitter think that overall those they are following have useful things to say. About 22% think that they get their most valuable information from Twitter. This may seem low but is rather significant. However, it may also change with time".

The survey was done during a time when Twitter was more popular. These studies are a bit like fresh milk and need to be updated regularly to be relevant.

The next editorial note is entitled "The disciplines of management and IT have indeed merged: new empirical data" (Vol 8, No 1, 2018). By this time social media intelligence had become dominating for all kinds of market intelligence. Gathering information is now mostly about forms of web-intelligence. Intelligence and social research are now closely related (Vol 8, No 1, 2018). We see this in the next editorial note title as well, "Social media intelligence" (Vol 8, No 2, 2018). This issue had, for the first time, an editorial note that looks backwards and compares previous issues to confirm the strength of this change in how companies gather information.

The next editorial note is named "Why you should be interested in intelligence studies" (Vol 8, No 3, 2018). In it I argue for what I think is the core of intelligence studies:

> "It is suggested that the difference between information science in business, business- and market research and intelligence studies is mainly one of perspective and scope and less one about the content of problems or scientific methods used. Intelligence studies in business see the organization much like an intelligence organization, the offspring of the study of state and military intelligence, where the aim is to find information that affects the business as a whole (as in 'surrounding world analysis' or in Swedish 'omvärldsanalys'). A study of intelligence studies – management information or information sciences - that does not explain which outside events affect the business becomes sterile and uninteresting. The essence of intelligence is to scan the world for relevant developments, to find out what is going on that afftects our organization (need-to-know, strong signals, trends). How

to do this should be the focus of the subjects' research agenda and what sets it apart from other disciplines studying information in a business context." P. 4

There is also a summary of my conviction about what has gone wrong in the study of business in general and for the study of information in particular:

"Sometimes this goal seems far away as when reading about how a new technique is applied to an industry in a specific market. Sometimes I miss hearing about how basic methods like traveling to foreign countries (the spirit of Marco Polo) and reading books may be the best methods for understanding what affects an organization. We must always remember that the technology is only there to facilitate the process, it never explains why things happen and it seldom helps us in the actual understanding of the data. Statistical analysis does not explain why or how things occur: at best it summarizes what has happened. Authors of articles I read in other journals too often miss the difference between correlation and causation. What is then so special and different with intelligence studies? Intelligence studies - at the present at least - are less a series of theories than a new perspective on (micro and macro) economics. Intelligence studies is not exclusively about management, but also about economics as it's just as relevant for how nation states become competitive. It is the suggestion that competitive organizations of all sizes are best organized as intelligence organizations, focusing on the process of gathering, analyzing and delivering need to know information to decision makers. This is a different way of looking at organizations and what they do. Competitive organizations today all basically work with information. It is how they work with this information that decides whether or not they will succeed. The importance of building a formal intelligence organization was realized more than two hundred years ago in the military domain with the Prussian and Russian armies. In the study of business this was first realized with the shift in thinking that came with the Information Age and the development of computers, the realization that competitive advantage is more about what you know than what machinery you own or how much money you have in your accounts. If the introduction of IT represented the 1.0 version of this development, then the introduction of the Internet represents the 2.0. Many saw this development coming. Some experts thought that it would not only lead to intelligence studies being introduced as a special function in the organization but that we would see the implementation of separate departments of intelligence, or that the whole current division and structure of business activities, into marketing HRM, finance, would be abandoned for functions of intelligence gathering. When this did not materialize many started to question the value of the approach all together. Many still think that the approach failed, that the perspective has passed and been surpassed by other subjects and disciplines. I disagree. Even though things have not happened as quickly as many expected or hoped, we are still moving in that direction now more than ever. B2B digital marketing is a good example. Today it is less about push marketing and sales and more about gathering and distributing valuable information to potential customers. When customers see that we are knowledgeable not only about our products but also about the industry we are in, they start to trust us and we are able to build a customer relationship. This is not only changing how B2B marketing is done, but also the competences needed to succeed in B2B marketing. On the state or macro level we are living in a period of (neo-) mercantilism and geoeconomics where intelligence is key. The states that are succeeding economically today are countries like China, Singapore, and South Korea, but also Norway. These are representatives of state capitalism, not free market liberalism. The individualist, liberalist model supported by neoclassical economics and its foundation in the writing of Adam Smith (not always fairly interpreted, so I prefer to call them the marginalist school), Walras, Marshall and Samuelsson, have greater difficulty convincing readers today. As Piketty showed in his vast empirical project about capital, their (our) societies led to an extreme wealth being assembled at the very top with very little trickle-down effects. When the crises came it was the rest of society that had to take the hit, while the elites bailed themselves out to save a dysfunctional system. After a period of prosperity, which lasted for some four generations (and was only extended during the past two generations through massive debt), the populations in the Western world are experiencing a decline in their standard of living. These causes were all missed by the marginalist school whose members have been advising governments for more than half a century. The consequences of these policies have been massive protests and disbelief - almost hatred - of their own elites as in the US, but also in France, the UK and Italy. The point is that our leading social science paradigms and especially our economic and management theories that brought us here by not being relevant and, worse, by supporting the wrong policies; regardless of the good intentions, which many of my colleagues even doubt. Mainstream economics combined with too narrowly and fragmented studies of management obsessed with a method of small empirical investigations have become the

supporters, not only of an elite – the status quo- but more worryingly of an uncompetitive society. Now, for business studies that is almost what we should call a contradiction. Our reigning business theories and research are making us less competitive. The new economic powers in the East have copied what has been done well in the West, but it is unlikely that they will copy our leading social science paradigm. It is the message China sends out when it says "…with Chinese characteristics". Chinese leaders are following the thinking of Drucker, Schumpeter, and Michael Porter; more so than the winners of the Nobel prize in Economics and their schools of thinking. They are not reading our thousands of small business journals, even though their own scholars are taking a larger part in the work of running them and contributing to them. Instead they are first and foremost inspired by their own values, their own history and their own thinkers of strategy and philosophy. China is already a superpower of intelligence gathering, which they see as essential for strategy. Not only have our theories of political science been contested, but there is now clear critic of Western Moralism. There are hardly any independent thinkers outside the Western world who believe in the good intentions of Western political and economic interferences anymore. As we in the West have failed to keep up the living standard of our middle classes (our promise to the voters) "Eastern arguments" are starting to convince a large part of our own populations in the West. The failure of the Western world to compete becomes a confirmation of the weaknesses of our strategic thinking (the weakness in our political system to make plans), and in our ideas which at the end is a critic of our reigning social science projects. Eastern ideas will be closer to practice. The West is left with a number of paradoxes. For all our interest in strategy during the past two decades we have no strategy, no long term thinking and no major infrastructural projects. Instead we are consumed with our immediate problems and crisis handling. We are so obsessed with the critic of China as a dictatorship that we refuse to see that they are undertaking the largest infrastructural project in world history (the Belt and Road Initiative, or BRI), that their mercantilist ideas are engulfing our markets but also helping to improve the living standard of people living in the developing world. Our media is full of stories about Chinese exploitation in the developing world, which also exist, but forgetting that exploitation - even slavery - used to be our specialty for centuries and the hallmark of the British Empire. Now, what does this all mean for business studies? It means we have to search for other paradigms other than the existing one if we want to become competitive again. We have to become more interested in what is actually going on in the world, more curious. This reality must be led by business disciplines."

After this rather long explanation of the context of the study it's back to essentials in the next issue, as the editorial note is entitled "Developing new models for intelligence studies". It says "The aim of any social science is to develop theories and/or models to better understand the business reality. We are happy to see that a majority of contributions this time do exactly that." Very few articles in fact take this seriously, but in this issue we see a few attempts at least. The bigger question is also to what extent this theory building is possible in the social sciences. Most contributions are attempts. It's quite possible that the social sciences are best treated as an art, as Peter Drucker suggest.

In the issue (Vol 9, No 1, 2019) I also write an article entitled "How managers stay informed about the surrounding world". It's out of this wish to be practical and useful. It's an important question for intelligence studies and one that has to be frequently updated empirically to be of value to managers. The conclusions were quite telling, I think:

"• No one said they read books • New media companies are dominating as providers of competitive information: Google, YouTube, LinkedIn, Facebook, Twitter • People watch TV news first of all, to the extent that the content is available on YouTube • Trade shows are a major source of information • Radio is not a significant source of information anymore, with the exception of in places like the African continent and to a certain extent in France • HUMINT is still considered highly relevant for information gathering, on all levels and across organizations. This includes "coworkers and colleagues", but also gossip and "friends in the media". • Many managers say they get their best information through emails, from Google and the act of googling. This makes Google LLC the single most important source for competitive intelligence. • A number of reports are widely popular, for example from OECD, IMF, and the World Bank, but also those that are distributed by the major consulting companies. • Most managers read a combination of their local and/or national news and international news. • The most popular sources offline are The Economist, WSJ, and NY Times." P. 32

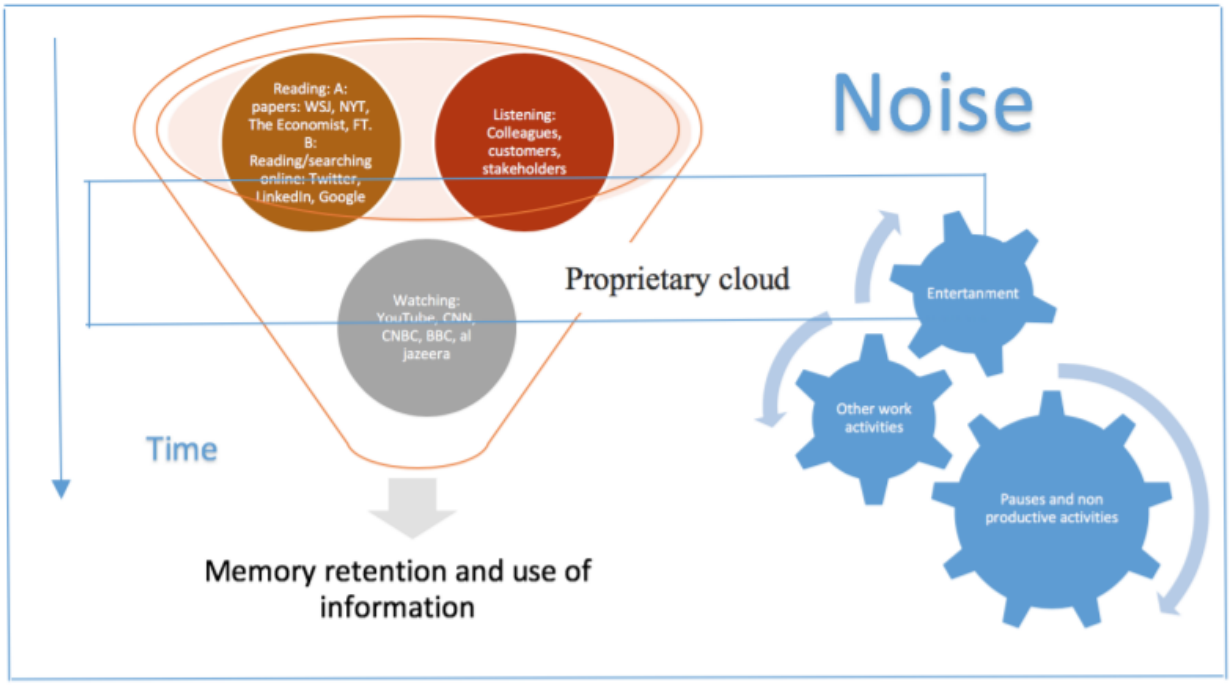


Figure 1 The manager's model for staying informed.

At this time there was a strong notion among practitioners that "open source is mostly noise". Ben Gillad, one of the founders of CI, is among those who raises his voice often on this topic, as with his recent book "The Opposite of Noise: The Power of Competitive Intelligence" (2021). It may be because of noise that managers are willing to pay for good information because searching in Open Source material is often found to be a waste of time, literary. There is good material on the web, but it takes too much time (and training) to find it. In my above-mentioned article, I suggest an intelligence model that takes this noise into consideration, inspired by The Shannon–Weaver model of communication[1]. This is shown in Figure 1.

It suggests that managers' intelligence set (what they know) is a function of reading, listening and watching disturbed by noise in the form of entertainment, other work activities and pauses and non-productive activities over time, corrected for the individual's ability to remember (memory retention) and to use/implement of what they have learned. I called this the manager's model for staying informed.

Around this time collective intelligence was a hot topic and the next editorial note was entitled "A deeper look at the collective intelligence phenomenon". My own review article was called "Making sense of the collective intelligence field: A review". It concluded that "the collective intelligence field is valuable, truly interdisciplinary, and part of a paradigm shift in the social sciences. However, the content is not new" p 6. This was later the start for a major bibliometric research project with some colleagues that resulted in an article that has just been accepted in Technological Forecasting & Social Change entitled "Understanding the structure, characteristics, and future of Collective Intelligence using Local and Global bibliometric analyses". It basically shows who are the major contributors, what academic tribe they belong to and where the study has been going.

The next editorial note is entitled "The argument that 'there is nothing new in the competitive intelligence field'" (Vol 9, No 3, 2019). The reason for writing this somewhat provocative piece was that many CI professionals who had been around for a while saw nothing new in CI and complained about it. In the editorial note I explain that "Another way to explain this development is to say that CI has evolved, thus is no longer the same". The problem, I think, is that experts were trying to check up on what they did, if it still existed, unwilling to see that the field had moved on and become something else. What was this new form? I suggest that intelligence studies now is more about "data mining, search engine optimization, social media marketing and digital marketing in general."

Vol 10, No 1, 2020 was entitled "On the 10th anniversary of JISIB: Reflection on academic tribalism." It was the 10th anniversary of the journal. In the editorial note I use the possibility to address the problem of academic tribalism for the development of science:

[1] The Shannon model has as its origin a model by H. Nyquist (1924) who uses "intelligence" instead of "information".

> "The unnecessary division of networks that look at the same phenomenon is sometimes referred to as "academic tribalism." Academic tribes become a barrier to learning and this can result in closemindedness. This is also according to my own experience. Academic clustering is a similar mechanism whereby graduates from one institution favor those who come from the same institution, but there are also those universities that systematically refrain from this. Among these is Harvard University, which seldom hires their own PhDs, or so I have been told. If so, that is probably better for the progress of science. Where is it meaningful to draw a line between academic groups then? Everyone will agree that the natural sciences are quite different from the humanities. Between psychology and business though there is much overlap with psychology in business. Between accounting and management, a good understanding of how to manage a business requires the knowledge of income statements, balance sheets and how to set up a cash flow analysis. One way to think about division is if the method is different. According to this criterion most social scientists should be able to do each other's work, and subsequently go to each other's conferences. Another meaningful division is based on experience and the depth of specialization obtained by the discipline. This criterion is less precise. I do not pretend to have the answer, but I think it's a pity that all these tribes exist, with their own buzzwords often studying more or less the same phenomenon, with the same methods. What distinguishes intelligence studies from other tribes is, in my opinion, first of all that we see that the private organization is better organized as an intelligence organization, with focus on information gathering and analysis. It has less to do with departments of marketing, HR or accounting, even though the one does not exclude the other. Another way is to see the intelligence organization as a superstructure, a layer that exists above all functional departments where the aim is to achieve a competitive advantage through better information. In this respect the need for CEOs is not unlike those of ministers of state. Now, is this perspective so radically different that it deserves its own tribe with its own journal and conferences? That is the important question. And in some way, I cannot help but think that learning would be better without them, that is, it would be better if it was all one big interchangeable group, going to one another's conferences, and writing for each other's journals. Science would benefit from it. From time to time I have also peeked over into other groups and joined their conferences. What is astonishing especially for an outsider is that you are immediately confronted with a pecking order that is related to who has been there the longest and published the most in the group. This cannot be an advantage for the advancement of science, I tell myself. But, then again, pecking orders seems to be the rule rather than the exception for most social creatures, not only chicken." P. 4-5

Academic tribalism is probably a major reason why the social science are not moving forward in the way many had expected, helping organizations to solve practical problems and making them more competitive. Our job should not be to produce as many articles as possible, or to gather as many citations as possible from Google Scholar but to try to be relevant, that is of real use. This was easier before when many professors were also business consultants and the pressure to publish in journals was lighter.

Vol 10, No 2, 2020 is entitled "The impasse of competitive intelligence today is not a failure. A special issue for papers at the ICI 2020 Conference". The editorial note is a continuation of the previous under the title "The argument that 'there is nothing new in the competitive intelligence field'". This was to show that there is a problem, but that that problem is more in the way we study these subjects, the methodology. I start with a brief historical perspective:

> "Intelligence studies started as strategy, the "art of troop leader; office of general, command, generalship", both in Europe (in Greece as stratēgia, but first of all much later with Carl von Clausewitz' book "On War", 1832) and in China much earlier with the seven military classics (Jiang Ziya, the methods of the Sima, Sun Tzu, Wu Qi, Wei Liaozi, the three strategies of Huang Shigong and the Questions and Replies between Tang Taizong and Li Weigong). The entities studied then were nation states. Later, corporations often became just as powerful as states and their leaders demanded similar strategic thinking. Many of the ideas came initially from geopolitics as developed in the 19th century, and later with the spread of multinational companies at the end of the 20th century, with geoeconomics. What is unique for intelligence studies is the focus on information— not primarily geography or natural resources— as a source for competitive advantage. Ideas of strategy and information developed into social intelligence with Stevan Dedijer in the 1960s and became the title of a course he gave at the University of Lund in the 1970s. In the US this direction came to be known as business intelligence. At a fast pace we then saw the introduction of corporate intelligence, strategic intelligence and competitive intelligence. Inspired by the writings of Mikael Porter on strategy, as related to the notion of competitive advantage the field of competitive intelligence, a considerable body of articles and books were written in the 1980s and 1990s. This was primarily in

the US, but interest spread to Europe and other parts of the world, much due to the advocacy of the Society of Competitive Intelligence Professionals (SCIP). In France there was a parallel development with "intelligence économique", "Veille" and "Guerre économique", in Germany with "Wettbewerbserkundung" and in Sweden with "omvärldsanalys," just to give some examples. On the technological side, things were changing even faster, not only with computers but also software. Oracle corporation landed a big contract with the CIA and showed how data analysis could be done efficiently. From then on, the software side of the development gained most of the interest from companies. Business intelligence was sometimes treated as enterprise resource planning (ERP), customer relations management (CRM) and supply chain management (SCM). Competitive intelligence was associated primarily with the management side of things as we entered the new millennium. Market intelligence became a more popular term during the first decade, knowledge management developed into its own field, financial intelligence became a specialty linked to the detection of fraud and crime primarily in banks, and during the last decade we have seen a renewed interest for planning, in the form of future studies, or futurology and foresight, but also environmental scanning. With the development of Big Data, data mining and artificial intelligence there is now a strong interest in collective intelligence, which is about how to make better decisions together. Collective intelligence and foresight were the main topics of the ICI 2020 conference. All articles published in this issue are from presentations at that conference. The common denominator for the theoretical development described above is the Information Age, which is about one's ability to analyze large amounts of data with the help of computers. What is driving the development is first of all technical innovations in computer science (both hardware and software), while the management side is more concerned with questions about implementation and use. Management disciplines that did not follow up on new technical developments but defined themselves separately or independently from these transformations have become irrelevant. Survival as a discipline is all about being relevant. It's the journey of all theory, and of all sciences to go from "funeral to funeral" to borrow an often-used phrase: ideas are developed and tested against reality. Adjustments are made and new ideas developed based on the critic. It's the way we create knowledge and achieve progress. It's never a straight line but can be seen as a large number of trials and solutions to problems that change in shape, a process that never promises to be done, but is ever-changing, much like the human evolution we are a part of. This is also the development of the discipline of intelligence studies and on a more basic level of market research, which is about how to gather information and data, to gain a competitive advantage. Today intelligence studies and technology live in a true symbiosis, just like the disciplines of marketing and digital marketing. This means that it is no longer meaningful to study management practices alone while ignoring developments in hardware and software. The competitive intelligence (CI) field is one such discipline to the extent that we can say that CI now is a chapter in the history of management thought, dated to around 1980-2010, equivalent to a generation. It is not so that it will disappear, but more likely phased out. Some of the methods developed under its direction will continue to be used in other discipline. Most of the ideas labeled as CI were never exclusive to CI in the first place, but borrowed from other disciplines. They were also copied in other disciplines, which is common practice in all management disciplines. Looking at everything that has been done under the CI label the legacy of CI is considerable. New directions will appear that better fit current business practices. Many of these will seem similar in content to previous contributions, but there will also be elements that are new. To be sure new suggestions are not mere buzzwords we have to ask critical questions like: how is this discipline defined and how is it different from existing disciplines? It is the meaning that should interest us, not the labels we put on them. Unlike consultants, academics and researchers have a real obligation to bring clarity and order in the myriad ideas."

The editorial note in Vol 10, No 3, 2020 is entitled: "Labeling or science-by-buzzwords: The semantic trap in academic research and how to get out of it". In the editorial note I suggest a way to get out of the buzzword-mire of the social sciences. We should instead focus on the problems:

"The social sciences are drowning in new fancy academic terms or buzzwords, labels with unprecise definitions, rebranding phenomenon that somehow seem familiar. We are all surrounded by smart cities, innovation, and sustainability. What do these terms mean that we could not express earlier? Introducing them also raises new questions, which at first may seem provocative: Are there dumb cities too, if so where? Do we carry out research at our universities that is not innovative? Does the literature on sustainability make our products more sustainable? Above all, these new fields are formulated in almost suspiciously positive terms attracting the attention of our politicians and echoed everywhere. How can anyone be against smart cities, innovation and sustainability? It must

be good, important and therefore it deserves funding. Creating new terms to describe what is mostly old and familiar problems (relabeling) is not helping move science forward but instead hindering its development as it leads the researcher to believe he or she is setting out on a new quest, while often just ignoring past literature, especially that written in French and German languages, which then suddenly does not apply. The same is true for intelligence studies. "Research" today is too often reduced to searching for articles in one of two commercial databases: Web of Science (Clarivate Analytics) or Scopus (Elsevier), basically consisting of articles that have been written during the past two generations. Here we are supposed to cite the most cited articles, even though the same ideas (but with different words) have been expressed numerous times before in older articles, books or are just common sense, so that whoever wrote the first article become popular. This then is the pyramid scheme of the brave new world of the social sciences, a system that creates academic peacocks. The majority of social science researchers today are not first of all knowledgeable in say economics or business, but of how to produce articles. That is a skill that has less to do with what is happening in the real world of social behavior. That is the price we must pay, some say, but the actual production of research also attracts very little attention outside of the circle of academics who contribute to it. Moreover, it makes our business education less relevant. Ask yourself, if today's business education was relevant, why are the Chinese outperforming the West? Why are there so few famous business schools in economically successful countries like Germany, Taiwan, or South Korea? Who teaches you how best to succeed in business life, the authors of the most cites scientific articles in business and management or the Chinese classic authors, like Confucius or Sun Tzu? When I got interested in intelligence as a business student it was based on the notion that better information can make organizations more competitive. This was still during the first generation after the start of what was called the information age, when companies realized that information and knowledge, not physical assets, were the most important ingredients for business success. There was no internet, nor mobile phones. I was interested in the following questions: 1. How do organizations work with information? 2. What is the most effective way for organizations to work with information to obtain a competitive advantage? 3. Why are organizations not working more effectively with information? I was interested in these questions from an international perspective, curious about the relationship between specific cultures and production. So, much like Marco Polo, I asked myself: 4. What can we sell to other countries and what can we buy from them? 5. What is the best way of doing this? I am still predominantly interested in these questions and Marco Polo seems to follow me in my thoughts wherever I go and seek new knowledge. I am not interested in the semantics surrounding these questions, the new terms that are introduced more as labels than to give a more exact definition of the underlying phenomenon we are looking at. To make things even worse, these new labels change, and quite frequently, in what looks like ever-shorter life cycles of social science research fields, replacing each other after quick overlaps. It is much like watching trends in the clothing industry. Suddenly you realize that your corduroy pants that work perfectly and have no holes in them need to be changed out. Your surroundings demand it. To take a more fitting example: I was interested in how people work together with information as we started a research project on why employees hide information. Here, I am not interested in collective intelligence, competitive intelligence, co-creation, wisdom of crowds, knowledge management, complex systems, or systems theory, just to take some examples. I am first of all interested in the problem. Many academics mix labels with theory. Theory does not mean to name labels, but to present similar problems in other studies, to say if they reached similar or different results and to try to explain why this may have been the case and what it means for our own study. This can be done almost completely without using labels. Still, I tend to spend more time on semantics than on actual problems, very much against my own will. It's like my academic surroundings impose this on me. It seems that most business researchers fall into the same semantic trap. It's not only due to how we label problems with key words in databases, but also to the way we organize ourselves as researchers. The process can be explained as follows: Business researchers quickly try to own the terms that they become interested in instead of focusing on the problems and problem areas that they are interested in. Instead of broadening the field, we narrow it, becoming specialists in ever smaller parts, all with their own labels. After a few rounds we are no longer in contact with business life anymore. There is another variation of this problem and that is when the academic discipline is in close contact with industry even though it is erroneous. To me the scariest example of this is the study of economics after Keynes, which is sometimes referred to as Neoclassic economics. It seems clear to me that the major reason that banks, the financial sector and the organizations supporting this industry pay lip service to the study of modern economics is that it legitimizes a corrupt and close to bankrupt system that does little good to others outside of its own members. Any problem can be studied from the perspective of numerous terms. Often it does not matter which term we use as there are many terms that overlap and can be relevant simultaneously.

Instead of accepting this, academics strive to own the terms they chose to use and to disown others, especially those that are closely linked. As soon as we identify ourselves with one term, we start to oppose other, similar terms, treating them almost as competitors, as we often compete for the same or similar research positions and grants. New academics come along and pick their label, often by accident, for example, when adopting the preferred label of a supervisor, until each term forms or constitutes an academic tribe. These academic tribes then develop their own conferences and journals, and an internal struggle finds place, a race to establish legitimacy around an internal hierarchy most often built on the popularity (impact) of articles, and less so on the quality of the content or its relevance. It's also possible to be in several tribes at the same time, even though academics normally have a clear preference of one above the other, simply because it's difficult to excel in more than one area. As an example, authors in the field of collective intelligence also study artificial intelligence, collective behaviour, swarm intelligence, complex systems, machine learning, human-computer interaction, multiagent systems, sustainability, information systems design, crowd work, evolutionary computation, social decision making, empathy justice, foresight, futures research, crowdsourcing, information systems network, and/or democratic theory. Collective intelligence is used synonymously or in combination with co-creation, wisdom of crowds, opens source, social systems, and social complexity, all with their own tribes. Within intelligence studies we have sub-tribes in the form of competitive intelligence, market intelligence, competitor intelligence, business intelligence, enterprise resource planning, social intelligence, all of whom deal with the problem of collective intelligence. Close by there are the tribes of futures studies and foresight. In a corner sits the library sciences. Across the road there are the tribes of decision making, decision sciences, information sciences. All are quite familiar with the same phenomenon studied as collective intelligence. In other disciplines there are similar labels and key words, for example collective behavior in the study of sociology. The problem is that researchers seldom direct their attention outside of their own tribe. This is not only an odd scientific process, but we are witnessing an enormous waste of intellectual ability and potential. So, how do we solve it? To become more relevant academic research must redirect its focus from buzzwords to problems, not just smart "research gaps" in the literature. Instead of listing keywords, researchers, academic journals and academic databases should list problems (1), and the problems should be stated in full sentences (2) using as few (3) and as simple words as possible (4). We should also insist on clear, mutually exclusive definitions. By searching for problems instead of labels it will become much easier to find relevant research across different labels and disciplines. We need to be much stricter when admitting new labels. If a new term is not exact and not much different from a previous term it should be declined. Focus should be on what the Germans since the 19th century understand by "verstehen", as the "interpretive or participatory" examination of social phenomena, not on coining new terms. Today new terms often come to life because we did not read enough, or we thought more about internal marketing and our own self-promotion instead of focusing on problems that are important for humanity. We are all guilty of this to a certain degree as it's difficult to escape the logic trap that is our current social science research system. We need to instill a new critical process of thinking by asking: What problem does this field of study lay claim to? Are there other studies that lay claim to the same problem? If yes, go back to the previous field. If it does not exist anywhere, and if you are 100% certain, only then can you coin a new term after consulting with your peers. This process would lead to the merger of most of all existing social science research today. The same could then be done with conferences and academic journals. Larger academic groups will again improve the quality of journals and conferences, thus improve the advancement of science. To complicate things further labels are sometimes decided outside of academia. The world of business is basically changed by its practitioners, not by academics. As an example, competitive and market intelligence is now often replaced by competitive and market insights (CMI) in many major companies. The intelligence label was always problematic and the association to the world of spying never quite washed off. It did not help that many successful business intelligence companies functioned more as private eyes with aggressive methods despite organizations like SCIP setting standards to the contrary. Many were also skeptical to what they understood as an Anglo-Saxon and predominantly American agenda to spread the practice of industrial espionage advocated by consultants centered around Langley. The difference between the term intelligence and insights is not significant. It basically means the same: valuable information, need-to-know for the competitiveness of the firm. Put differently, there is hardly any part of insights that cannot be seen as intelligence and vice versa. However, it could be argued that market insight is a broader take on business information. It could be said that it brings together a wider group of fields, both practitioner and academics, some of whom were left behind in the process when smaller academic tribes were created. Market researchers, business intelligence specialists and all kinds of information scientists are now lured back together under the umbrella of

earlier pioneers like the visionary businessman Alvin Toffler, the mathematician Claud Shannon, and Gabriel Naudé, the father of library sciences, just to give a few examples. The "insight people" have already started to form their own group. Academics are likely to follow. Other academics are already finding themselves sitting in groups that are no longer relevant wondering what happened. The academic projects that are the most successful will always be those that follow the development in business life. The discipline of digital marketing is a good example. Digital marketing is fundamentally different from the old "brick marketing," to the point that if you do not understand its logic today then your education is not relevant any longer. It took academia a long time to understand this and for a few years the whole discipline of marketing was terribly far behind reality. The advancement of the field still almost exclusively finds its place in business organizations. Academics are mostly trying to run after and catch up with the practitioners in this field of study. One reason for this is that advancements in digital marketing demand substantial IT infrastructure that academics do not have easy access to. The situation is similar in business intelligence, which is basically about new software today. The leading AI experts do not work in academia but in the major tech companies. It is all about being relevant and useful. In intelligence studies there is a demand on us that we integrate business practices with more technology (hardware and software). Only then can we hope to make real academic contributions in this field. We stand in front of an almost awkward situation: the intelligence field has never been more relevant in the history of mankind as information has become the most important ingredient for competitive advantage. And the more information, and the better information, the more valuable the company. All the new and major MNEs around us are living proof of this, whether it be Alphabet (Google), Netflix, Spotify, Facebook or Alibaba. To understand and be able to contribute to this domain we must be interested in the same problems that they are trying to solve. To this aim the labels are often just distractions, a semantic trap."

The editorial note in Vol 11, No 1, 2021 raises a warning: "The internet is leading the world towards forms of totalitarianism: How to fix the problem". The problem is real, also in the Western world, as we have seen through a series of revelations, not only those of Mr. Assange and Mr. Snowden. As an example, after the editorial note was published, the head of Danish intelligence was arrested, it seems, for having told the press that his employer not only cooperated with NSA but had become a mere tool for American espionage in Europe. He is still in prison. Needless to say, the intelligence services in the Western world are confronted with a real legitimacy problem as part of a democratic political system. How did surveillance go wrong?

"It is difficult to imagine intelligence studies as separate from information technology as we enter the third decade of the 21st century. The current issue of JISIB bears witness to this integration with a strong focus on big data applications. Hardly anyone today would or could do without the internet, but the project that started with US government financing in the 1960s, with packet switching, and in the 1970s with ARPANET and saw commercial light in the 1990s is helping countries turn into totalitarian systems where totalitarianism is defined by a high degree of control over public and private life. Public life is influenced by hacking, troll factories, fake news/propaganda, and interference in elections. Private life is influenced by massive surveillance. To borrow the title of the book by Zuboff (2019) we now live in "the age of surveillance capitalism". Business intelligence systems lie at the heart of this transformation, but so do artificial intelligence and robotics. And the trend is global. In the West the suppressors are mostly private monopolies (e.g. Google, Facebook), while in the East it is primarily the government that is snooping (e.g. China's Social Credit System). Face recognition is likely to become as popular in the West as it is in the East. It is also easily forgotten that no city was better surveilled than London, which started to build its CCTV technology in the 1960s. The system is now being updated with facial recognition, just like the one we are criticizing the Chinese for having. Some forms of surveillance may also lead to great advances in our societies, like access to government forms and statements electronically and a non-anonymous Central Bank Digital Currency (CBDC), which promises to reduce corruption and tax fraud, and could be used for easy distribution of universal basic income (UBI). Fintech promises to be highly disruptive. We are moving into an Orwellian world of surveillance more or less voluntarily, often applauding it. "I have nothing to hide" the young man says, but then he later becomes a minister and starts to worry about the traces he has left on keyboards. The Five Eyes intelligence alliance, or any other major service, can pull out extensive analyses of behavior and personality on most of us now as we continue to exchange our personal data for access to searches and social media, but also subscription-based services. Most Chinese think that the social credit system is a good thing. This is for much of the same reason: they believe it will not be used against them and think that they will

do well. We all tend to be overoptimistic about our abilities and opportunities. It's not before we fail that the full implications of the system are felt: lack of access, credit, housing, and no more preferential treatments. The result threatens to worsen the lack of social mobility and increase the growing conflict between the super-rich and those hundreds of millions who risk slipping from the middle class to being counted among the poor, many of whom live in the Western world. The truth is another essential part of our civilization that we are now tampering with. On the internet, few users can tell facts from lies, but we think we can. Most of those who grew up only with the internet never really learned how to think critically. The old library of physical books was the best guarantee that lessons learned from history would be transferred to future generations without anyone mingling. For that same reason, books were also seen as real threats to tyrants and have been censured and burned. The last time that happened in the West on a large scale was in Nazi Germany, but it is happening again now in subtler forms as Amazon and other giants act as arbiter and refuse books with certain content based on value judgements. A world which relies all too much on the internet should recall that the information there can be switched off in a second. Old books are often not even accessible, having been exchanged for online solutions. The situation in the brave new social sciences is much the same, everyone is running after the latest articles without ever questioning if the same ideas have been published before (difficult to know now). Thus, much academic literature suffers, becoming a tedious process of repetitions under new brands. In a society where everyone is a writer, no one really reads or has much of importance to say at the end. How do we solve these problems? Step one on the internet is serious encryption as to make data private. Step two is to give all personal data back to the users, that is, to take it away from the private companies and then indirectly away from the security services. That will eliminate the "free" business model and lead to more subscription-based products instead. Step three is to break up the monopolies, and before that to tax them properly. Step four is to return to books that have stood the test of time (real peer-reviewed) whether online or offline. (The learning process is probably only half as good on the screen). We need to go from a culture of skimming data back to reading and discussing it. Technology and management practices should be a part of that solution. Otherwise, it looks like we will continue down the road that leads to totalitarianism. The internet right now is making shopping easier, but most people are becoming less aware of realities, less smart, less critical. Only a small part of the population is able to use it to their advantage for understanding the world around them. It would be great to see more articles develop ideas and products for how we as societies can go in this direction."

My last editorial note (Vol 10, No 2, 2021) is entitled "Intelligence studies as an alternative approach to the study of economics". It revisits an old favorite topic, but taken a step further: one learns much more about economics from good factual observations of reality as events happen around the world than by spending time reading economic theory. The reason is that most economic theory is inaccurate or irrelevant:

"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 you 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."

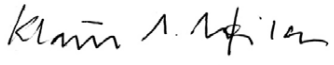
You learn economics best by gathering as much experience as you can from people who work with actual economic problems, either in the private or public sector. Thus, intelligence studies is also a method for how to study economic behavior.

In the article by van der Pol entitled "Collaboration Network Analysis for Competitive Intelligence", the author proposes a method that allows for the identification of collaboration strategies in a static and dynamic setting that also makes it easier to communicate on the results. The article by Olaleye et al. looks at how strategic thinking and competitive intelligence can result in innovating capabilities through management support. Faris Muhammad and Sri Hartono look at purchasing factors for Instagram users. Majidfar et al. look at an intelligence management model for national level organizations and found that attention to the managerial and operational levels is more important than environmental factors.

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.

This is by no means the end of intelligence studies in business. For my own part, last year was my most productive in more than a decade and I hope to continue with the same number of hours spent on research. However, there will be other outlets for these articles and publications, as there will be for all those papers presented by colleagues at intelligence-related conferences that take place every year.

On behalf of the Editorial Board,
Sincerely Yours,



Prof. Dr. Klaus Solberg Søilen
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Collaboration network analysis for competitive intelligence

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ABSTRACT The analysis of collaborations is an important aspect of competitive intelligence studies. Collaborations show who players turn to in order to gain access to external knowledge. Networks are often used to analyze collaborations. However, analyzing networks that become increasingly large, especially in a dynamic setting, is a difficult task. Communication on these questions is complex for the same reason. In this paper I propose a method that allows for the identification of collaboration strategies in a static and dynamic setting that also makes it easier to communicate the results. An application of the method is also provided to illustrate how the method can be used for competitive intelligence studies.

KEYWORDS Collaboration analysis, competitive intelligence, dynamic network analysis, network analysis, patents

1. INTRODUCTION

The number of collaborations between innovating firms has been steadily increasing for the last couple of decades (Saviotti, 2007; Tomasello et al. 2013). This observation can be explained on one hand by the complexification of technologies, resulting in firms no longer being able to master all technologies in-house (Powell et al. 1996, Fagerberg et al. 2004). On the other hand, there is value in adapting and combing existing technologies from other domains or searching for solutions in other domains to solve a problem in one's own domain. As a consequence, firms aim to access ressources held by other firms to enter new markets, improve their products or innovate. That being said, collaborations are not without risk. Two main types of risk are involved with collaborations. This first is the intrinsic risk of failure of the collaboration (Masrurul et al. 2012, Porter and Birdi 2018). Failure of the collaboration is mainly due to managerial differences between the contracting parties. It has been shown that for a collaboration to succeed, it is vital to make the aim of the project clear as well as the benefit for all the parties involved (Porter, 2003). This requires firms to be transparent about their strategic objectives, which is often information that firms would rather keep private. Exposition of strategic information is risky as it can be exploited by collaborators. This comes in addition to other opportunistic behaviour the collaborators might have (Gulati, 1995; Williamson 2007; Oxley and Sampson, 2004; Kesteloot and Veugelers, 1995). Nevertheless, overall the effects of collaborations on the performance of the firm have been proven to be positive, especially R&D collaborations. Accessing different knowledge sources is considered beneficial for the firm (McEvily and Marcus ,2005), for innovation (Kogut and Zander, 1992; Tsai, 2001), as well as for industrial performance (Watson, 2007).

Due to its importance, collaboration is an integral part of the innovation strategy. The resources accessed through collaboration are

combined with the core abilities of the firm to innovate. This means that from a competitive perspective, collaborators are a rival that is good in some cases and collaborations should be fully included into any technology or competitive intelligence analysis. When creating a technology landscape, it now common practice to use collaboration networks to provide a first impression on where firms search for external resources for innovation (Garcia-Garcia & Rodríguez, 2018). In these networks, firms are nodes and links represent collaborations. Typically, these types of networks lack a dynamic element that allows the analysist to gain insight into the evolution of the collaboration strategy of firms in the network.

The aim of this paper is to provide a method that simplifies dynamic network analysis by first classifying firms into four categories based on their position inside the network. The classification is then computed at different points in time so that we can see if the behavior of the firms changes over time. This will make two aspects of network analysis easier for analysts. First, the complex structure of the network at the firm level is summarized in a category, and the change in position makes it easy to identify firms with atypical behavior. Atypical behavior is understood as a behavior that differs from the other nodes within the same network. This allows for the identification of newcomers, or firms that suddenly have a radical change in collaborative behavior. Once interesting firms are identified, one can zoom in on those firms in order to better understand their behavior.

This paper is organized as follows, first I will present the method that classifies players into four categories based on their position inside the network. I will then apply this method on a case study, lithium-ion accumulators, to illustrate what can be achieved with the method. The final section will conclude.

2. PLAYER CLASSIFICATION

2.1 Theoretical justifications

Given the different risks inherent in collaborating, firms will aim to reduce this risk as much as possible. Part of this can be achieved through managerial aspects such as clarifying the goal or the contribution of each party. Overall, a central force will be trust and reputation. When a firm is required to pick a collaborator, it will have to take into account different dimensions. First of all is of course the expertise of the potential collaborator. This can, however, be off-set by the reputation and/or trust one might have in this collaborator. A firm considered to be an expert in a field but also a notoriously bad collaborator might be put aside for a firm with less expertise but a better track record when it comes to collaborations.

When collaborations finish on good terms, this creates trust between the firms. The more trust, the easier it will become for firms to collaborate again in the future. Trust plays an important role in collaborations and has shown to have a positive impact on performance (Zaheer et al., 1998). After all, a new collaborator is a risky choice compared to a historic one that has already proven its worth. The more firms collaborate, the more they will be able to increase their capacity to absorb each others knowledge (Cohen and Levinthal, 1990) and recombine the knowledge to innovate (Cowan and Jonard, 2007). In addition, repeated collaboration allows for trust to grow and as trust grows, recommandations will also start to flow between firms resulting in strong ties between firms (Granovetter, 1973). Ties between firms are considered strong when there is a significant overlap in the collaborators of both firms. A positive side-effect of these strong ties is that firms know each other well. They are accustomed to one another's work ethic and methods, resulting in more efficient collaborations. Using this type of strategy to collaborate, i.e repeating historic collaborations and relying on strong ties, can result in a very dense network around the firm. This type of strategy, we will refer to as a closed strategy. The reason we call this a closed strategy will become clear when we look at how this looks from a network perspective. When we create nodes representing the firms and link the collaborations, we end up with a network that looks like the network on the left of Figure 1. The node in the center is the one we are interested in and we can clearly see that it has created a network of collaborators around it. Of course this image is a caricature, different levels of closed strategies can exist. Firms embedded in such networks benefit from firms being more willing to share information because of the social cohesion between the individuals in the firms and benefit from the increased productivity (Borgatti and Halgin, 2011; Kilduff and Brass, 2010).

Figure 1 An example of different collaboration strategies. The graph on the left shows a closed strategy while the graph on the right shows an open strategy.

There is, however, a downside to this strategy: there is a redundancy of knowledge inside the network of the firm. When one keeps collaborating with the same firms, the diversity of knowledge runs out, with a negative impact on R&D output (van der Pol, 2018). Creating links to firms that are outside of one's dense community allows the firm to gain access to a larger variety of knowledge. Granovetter referred to this effect as the "strength of weak links." Pushing this idea a bit further, firms can have a more sparsely connected network, like the one on the right in Figure 1. The node in the center of this network has a position that can be qualified as a gatekeeper position (Burt, 2004). This is a desirable position for a firm since it has control over the flow of knowledge between the nodes in the network. It is easy to take advantage of this type of position and it has been shown that firms in such a position can reap the benefits (Hargadon, 2002; Ahuja, 2000). In addition to the particular position of the firm, the fact that firms have more extensive indirect ties to firms in other parts of the network allows the firm to have a larger access to diversified sources of knowledge. These indirect ties are, for this reason, beneficial for the firm (Ahuja, 2000; Reagans and Zuckerman, 2008). This type of strategy we will refer to as an open strategy, in opposition to the closed strategy. An illustration is given in Figure 1. An open strategy is identified by a network position that is less densely connected while interconnecting different parts of a network as shown in the graph on the right.

Experience shows that when one analyses collaboration networks, different communities in a network are often correlated with different technological domains. This supports the theory on the importance of the gatekeeper position and the theory on weak links, since it implies that firms are able to reach different knowledge sources when connecting different parts of the network.

One final word on these strategies should be addressed to newcomers. The barriers to enter a network are not the same in the closed or the open case. In the closed case the barriers to enter are much higher. There will be more control of the different parties involved than in the case of the open strategy. This will be important when we aim at identifying newcomers and their position in the network. A newcomer included in a closed strategy will not have the same impact as a newcomer with a more peripheral role.

Nodes that are on the periphery are more ambiguous. They could either be newcomers or small companies that can only sustain a limited number of collaborations, or large companies that do not wish to collaborate much. In the latter case their position is a strategy while in the first it is merely a result of their status. We will still label this a closed strategy, in any case a player labeled as peripheral should be studied to ensure if the position is strategic or not.

2.2 Relating the strategies to network positions

We now need to find a way to identify the previously described strategies from the network positions of the players. To this end we will use different indicators commonly used in network analysis. The idea is to use two indicators that measure the extent to which a firm has created a dense community around it and the extent to which the firm is connected to other densely connected firms.

2.2.1 Identification of the closed strategy

We require an indicator that identifies the extent to which a firm is located in a densely knitted community. For this purpose, we will use a network indicator called the eigenvector centrality (EC). EC is what is called a prestige indicator that increases in value when a node is connected to highly connected nodes.

As show in Figure 2, low values are in green and the colours tend towards red when the indicator increases. The nodes in the densely connected part of the network have the highest value. The nodes at the extremities have low values when it comes to this indicator. Depending on the relative intensity to which the nodes are interconnected this value will vary between 0 and 1.

2.2.2 The identification of the open strategy

For the purpose of the identification of nodes that interconnect different communities, we use another centrality indicators: betweenness centrality (BC). This indicator computes how central a firm is in a network.

As shown in Figure 3, the firms that are in a more central position have the highest score with this indicator. Firms at the periphery have a lower score. The BC is a score that ranges from 0 to 1 and allows for the comparison between nodes in the same network. A word of caution, when a network is comprised of several connected components, these indicators must be computed per connected component.

Each indicator provides information on the position of the firm, and when combining the two indicators we can identify a higher variety of positions.

The extent to which these positions translate to strategies will be up to the analyst using the method to determine.

2.2.3 Combining both indicators: the position matrix

By combining the previous two indicators we can create a matrix with the BC on the y-axis and the EC on the x-axis. By doing so we create four areas that each reflect a different strategy. Firms with a high score in both indicators (top right section of the matrix) are connected to firms that have themselves many connections, while at the same time having a gatekeeper position. This implies that the firm collaborates with large firms specialised in their domain. This is in opposition to the upper left part of the matrix in which the firms collaborate with other communities through the presence of a supplier or another third party. Firms with a low score in both dimensions have a peripheral position, meaning that they just joined the network, are an exclusive supplier, or a start-up or young firm. The final section of the matrix identifies firms that have a dense community of firms around them.

This matrix can be used to plot the positions of players according to their BC and EC values (which should be centered and normalized). The matrix on the right shows how players can be represented in this matrix. A first dot represents the position of the player in the first period, the arrow indicates how the position of the player changes from one period to the next. In the case of the player at the top of the matrix, its position became more influential while the player at the bottom was pushed towards the periphery. This change in position makes it easier to identify firms that have atypical behavior from a collaboration perspective.

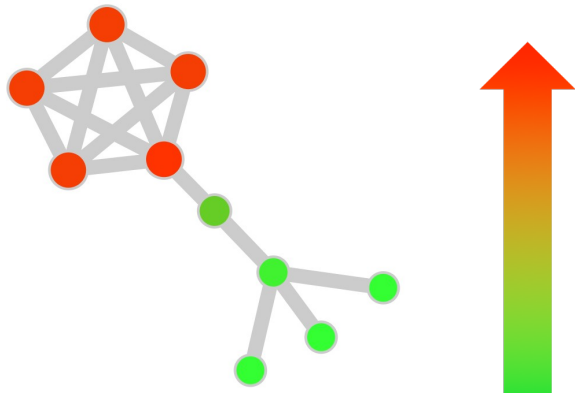

Figure 2 The eigenvector centrality measures the extent to which the firm is connected to firms with an important position in the network. The higher the score the more important the position of the firm.

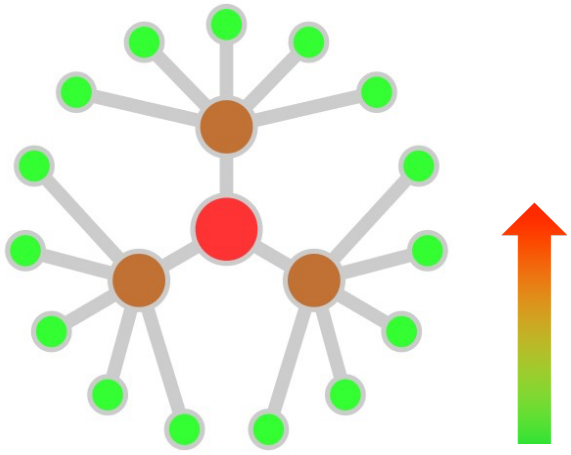

Figure 3 The betweenness centrality measures at the level of gatekeeper of the firm.

3. ILLUSTRATION OF THE METHOD: AN APPLICATION ON LITHIUM-ION ACCUMULATORS

The aim of this section is to show how to exploit the matrix described in the previous section. Even though the method can be used with any form of collaboration data, I will use patent data from the Orbit database from Questel. 28221 patents filed between 1990 and 2016 worldwide from which 3601 patents are co-filings will be used as our data source for collaboration data. Patents are widely used for competitive intelligence purposes (Jürgens & Herrero-Solana, 2017; Shaikh & Singhal, 2018; Flamand 2016).

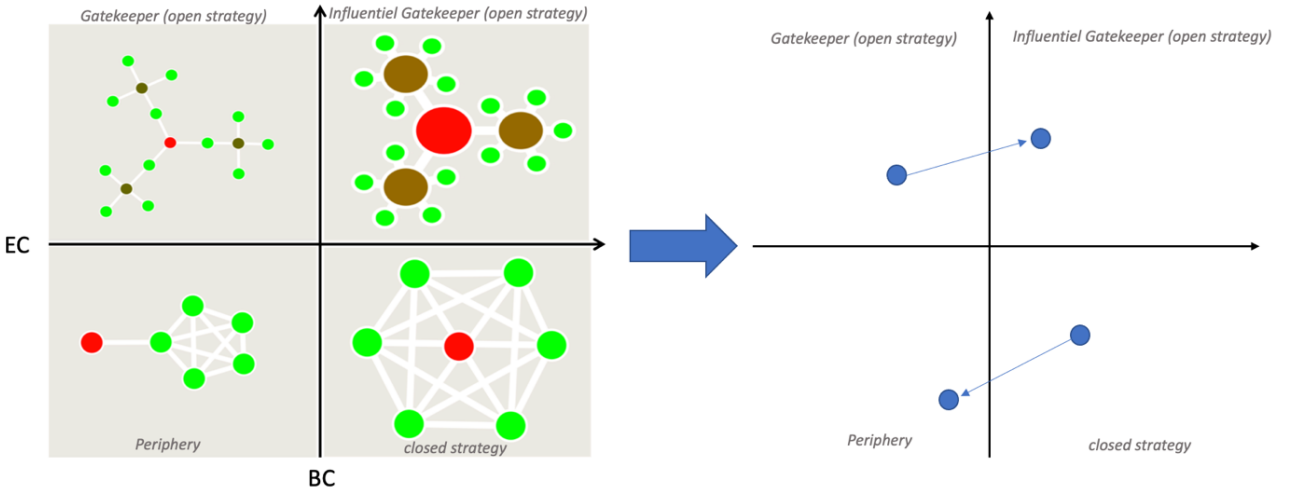

Figure 4 The position matrix in which each quadrant identifies a different collaboration strategy for the firm.

The sharing of intellectual property rights between firms is a strong signal since there is a legal component involved. Collaborations extracted from scientific publications for instance are much less binding and require less legal structure to be co-signed. In addition, patents contain a pool of information about the technology developed by the firms, which we will be able to exploit to further analyse the different collaborations that we have identified. I will show how this is accomplished in this application.

From the patent dataset, we will create a network at two points in time. A first network aggregates all collaborations between 1990 - 2010, a second 1990 - 2016. Figure 5 shows the topology of the network over the period under consideration (1990 - 2016).

Note the absence of secondary components in this network. Network indicators such as BC and EC can only be compared if they are computed within the same component. The secondary components (of which there are still quite a lot) must be analysed separately.

The objective now is to identify from this complex network the strategies of firms, and highlight signals of interest.

3.1 Position classification

For each of the firms I computed both centrality indicators for each of the periods. Then comes the question of the cut-off point where a firm is considered to be in a high or low position regarding each of the indicators.

I normalised the data by subtracting the mean and dividing by the standard deviation. This means that a firm is in the top right corner when its BC and EC are at least above average. A firm is on the bottom left if both indicators are below average.

Using the indicators, it becomes easy to identify firms that have changed their position, have not moved or have entered the network with a specific position. These are the signals we are interested in, the outliers in the data. In Figure 6, some interesting cases are visualised. The red circles indicate the position of the firm in the second period. Firms that do not have a blue dot entered the collaboration network in the second period. Examples are Foxconn and Nanotek Instruments. These firms are more on the supplier side and enter with a closed strategy implying that they are co-patenting with a small number of densely connected firms, which makes sense for a firm in a supplier position. Firms such as Samsung and Toyota work on the development of batteries while also using them in their products.

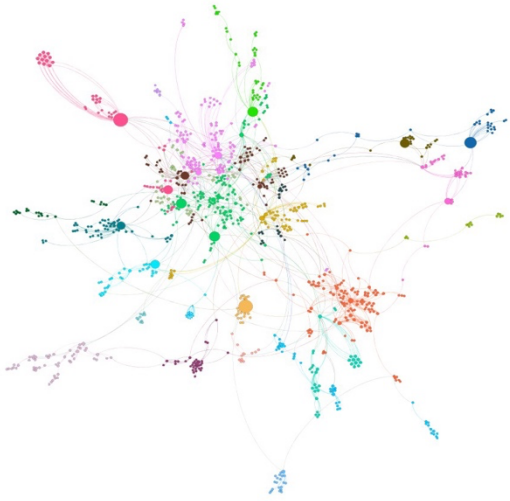

Figure 5 The giant component of the collaboration network in the technological domain of lithium-ion accumulators. Nodes represent firms and links represent collaborations between firms. The colours of the nodes represent communities of nodes that are densely interconnected as identified by modularity maximization.

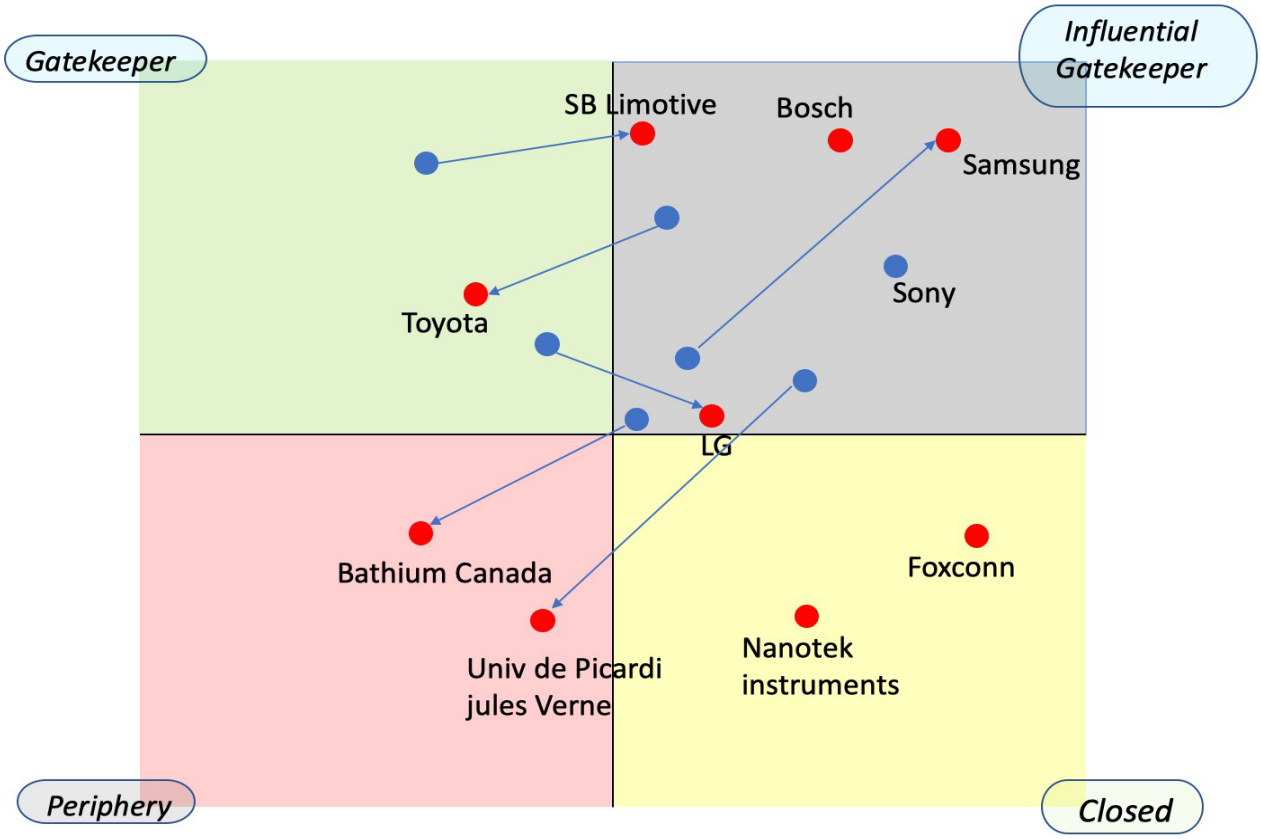

Figure 6 Classification of certain firms in the collaboration network. For clarity not all firms are displayed. The blue dot represents the position of the firm in the first period, the red dot represents the firm in the second period.

We can see that Samsung has strongly reinforced its position in the network and extended its reach since it has an open strategy. This is consistent with the strategy of the firm since it is present on the battery market for anything from smart watches to cars. Samsung announced its cooperation with carmakers for its batteries, but we do not observe any signal for that in the patent data. It could hence be interesting to add other types of collaboration data to the network (for example, publications or project data). Carmakers such as Renault, Toyota, Nissan and Peugeot seem to be mostly collaborating with universities and research institutes.

The position of Bosch, appearing in the second period, is highly linked to the position of Samsung due to a joint venture created by both firms in 2008, SB Limotive, and terminated in 2012. Bosch and Samsung also both reinforced their strategy by starting to co-patent with universities[1].

Not all firms reinforce their position in the network, some are pushed towards the periphery of the network in the second period while they were central in the first period. Bathium Canada and Univ de Picardie both ended on the periphery of the network. This is not so much because their own network changed but rather because the rest of the network evolved at a faster pace. Newcomers in the sector are also easy to detect. They did not simply appear in the network at a peripheral position, they entered the network directly with a highly central position. A simple glance at the table shows that these actors are mostly universities from Asia, with the exceptions of the University of Graz and Bosch.

Finally there is the interesting case of Sony, present in the first period but absent from the network in the second period. We will dig into this case in the next subsection.

3.2 The technological motivation for collaboration: the example of Sony

Once we have identified a company of interest, we can use other data in the patents to analyse in more detail what resources are accessed through collaboration. We can accomplish this

[1] *Note here that since the source of the data is patents it is possible that these collaborations existed before but the universities had no interest in filing patent, which seems to change nowadays.*

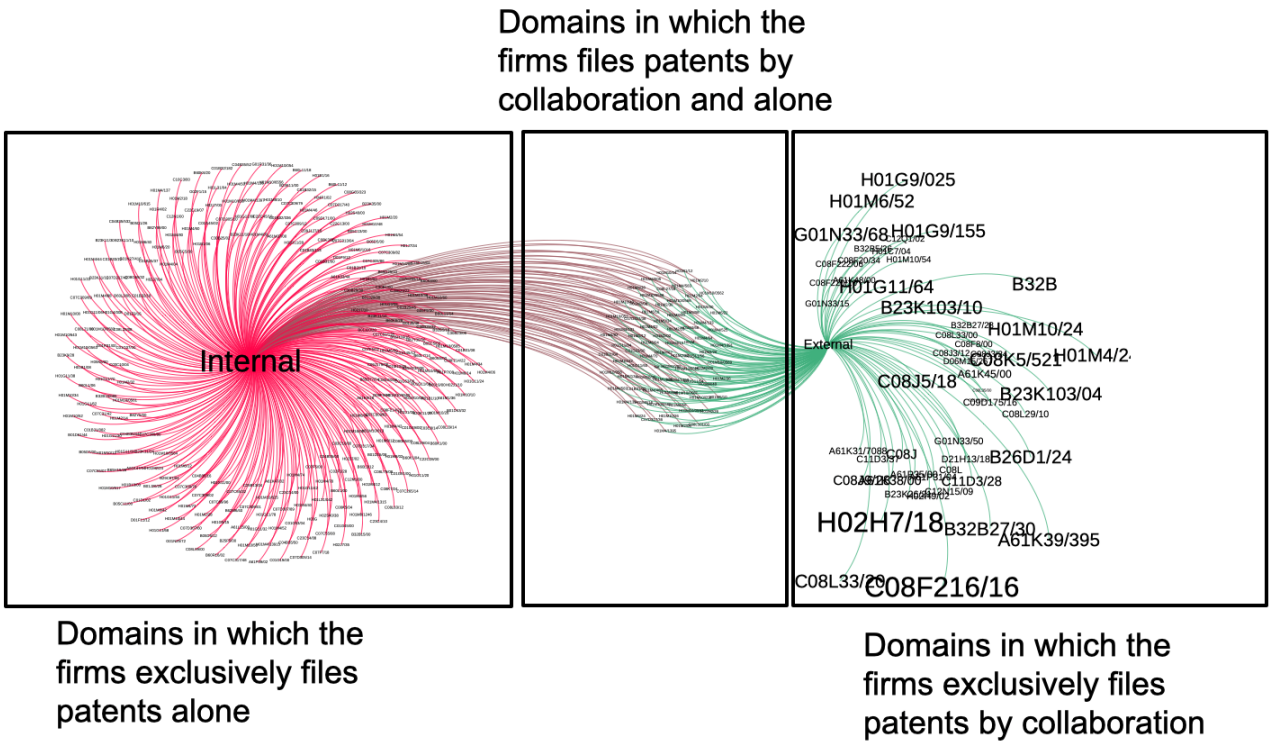

Figure 7 Analysis of the internal and external sources of Sony in the case of lithium-ion accumulators.

by the means of the International Patent Classification codes (IPC codes). IPC codes are added to a patent application by the examiners and provide us with a vision of the technological domain the patent is in. We use this information to analyse what domains the firms collaborate on. For instance, in the case of Sony, we can create a database with all patents filed alone by Sony and a database containing only the co-filed patents. Using these two datasets we can visualise the domains of interest to Sony and how they are mobilised. Figure 7 visualises the different IPC codes. On the left are the different domains in which the firm files patents under only its own name. On the outer right we find the domains with exclusively co-files patents. These are the domains in which the firm relies most on external resources.

As we will recall from the matrix, Sony exited the network in the second period. In order to get a better understanding as to why, we can have a closer look at the patents filed by Sony. In Table 1 I have highlighted some examples of domains that clearly show that in some domains Sony first required collaborations (H01M4/583 and H01M10/56). In 2003 however, the collaborations stopped and the firm started to file patents in its own name. This highlights that somehow the firm was able to internalise the technologies.

In other cases (H01M4/62 and H01M/0566), Sony had been filing patents alone, yet stopped collaborating in 2003, while sole deposits continued.

Table 1 Examples of domains in which Sony filed patents and the corresponding first and last year of first and last filings alone and by collaboration.

IPC code	Technological Domain	First collaboration	Last collaboration	First sole filing	Last sole filing
H01M4/583	Electrodes with graphite-intercalation compounds or CF	1992	2003	2003	2013
H01M10/056	Secondary cells characterised by the materials used as electrolytes	1998	2003	2003	2013
H01M4/62	Secondary cells characterised by the materials used as electrolytes Electrodes with a selection of inactive substances as ingredients for active masses	1996	2003	1995	2016
H01M/0566	Secondary cells with liquid materials	1996	2003	1994	2017

3.3 Comparing one's strategy with another firm

When it comes to competitive intelligence it is always interesting to compare one firm with another. As an example, I compare Sony and Samsung. Figure 8 shows a comparison of different domains of R&D between the two companies. As has been shown before, in the center are domains in common between the two companies. The colour on the links indicate if a code is unique to collaborations or not. In other words, if a code only presents co-filings for a firm, the link to that code is red. In the case of Sony, the code on the outer left indicates the domains Sony works on, but Samsung does not. Amidst those codes, there are five domains that are exclusively accessed through collaboration. These are therefor external resources that Samsung has not positioned itself on in the lithium-ion sector. Samsung has 15 domains in which it used exclusively external resources.

In the center of the graph, we find only one common point when it comes to external resourcing: H02H. Both firms use exclusively external resources in this domain. Even though the firms have some points in common there are still quite some differences between the two companies when it comes to external resourcing. The firms collaborate with different companies and it appears on different domains.

4. CONCLUSION AND DISCUSSION

This paper provides a method to analyze collaboration strategies of players in a dynamic setting. The method uses the structural position of players inside a collaboration network to classify them into a category. When this is done at several points in time, one can see the change in position of the player and trace its change in strategy. This allows the analysist to easily identify firms to analyze in more detail. The matrix in which the positions of the player are represented allows one to communicate the results in an easy and readable manner, since showing dynamic networks is often complex and confusing.

Even though the position of a player in a network is the reflection of its decisions (with whom they collaborate, how many times and when), it is not easy to ensure that these decisions are strategic. The results of the method should not be overinterpreted and results should always be complemented with other types of information to corroborate the findings.

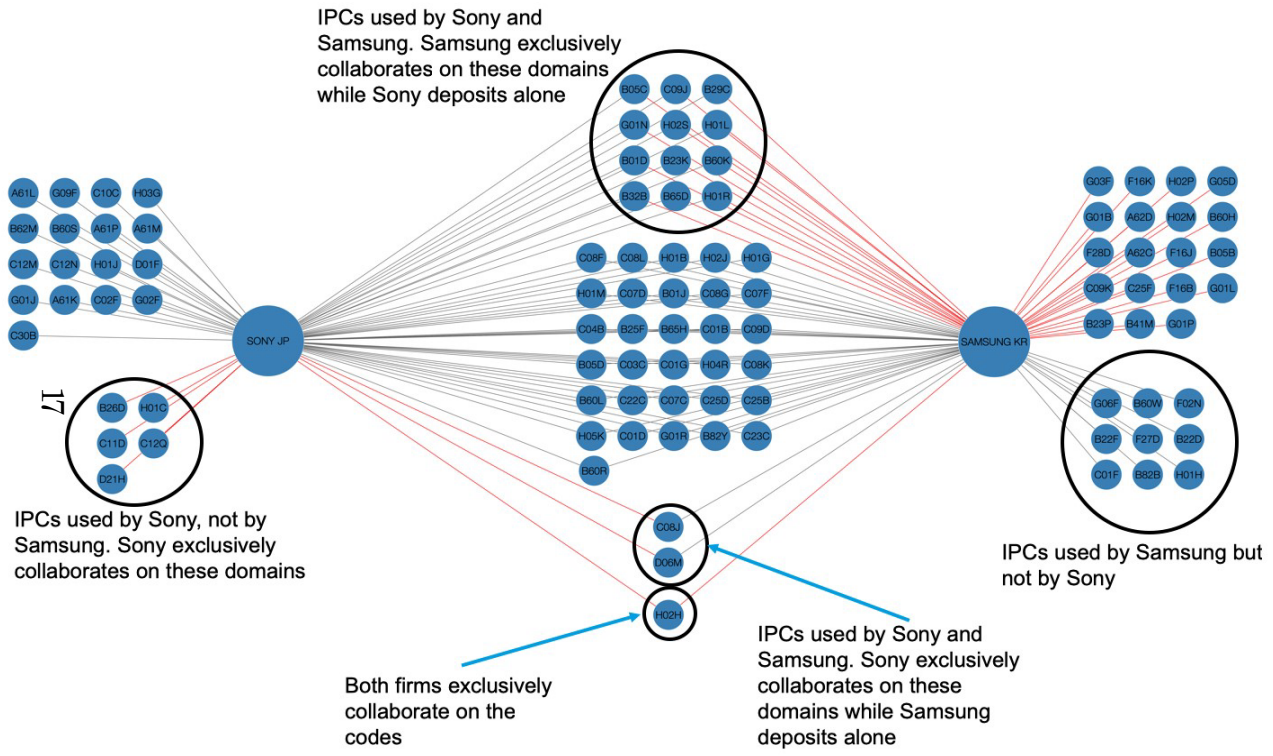

Figure 8 Comparing two firms in the same domain. The aim is to show common interest and specificities between the two companies. On the outer left side: domains specific to Sony, red lines indicate codes uniquely used through collaboration. In the center codes in common between the two companies, red lines indicating external resourcing exclusively.

A particularly tricky part of dynamics resides in the treatment of fusions and acquisitions. A sudden change in position can be the result of a firm acquiring another, and hence combine all the collaboration links. Patent data is often updated so that the latest name of the player will be on the patent document (even though there is no obligation for this in certain countries). For other sources of data (publications, research projects) this updating is not required nor is it usually performed. This can create a lot of noise in the data with new players appearing out of nowhere while they are in fact historic players that have changed their name. For these data-sources a thorough cleaning of the data is required.

The illustration of the method on the domain of lithium-ion accumulators shows how the method can be used in practice for competitive intelligence. We were able to identify players with interesting behavior (Sony, Samsung) as well as players that became less influential (Univ Picardi). The identification of these players allows us to search in more depth how they build their collaboration strategy and how they access external knowledge. In the case of Sony this allows us to see a clear change in their knowledge management since they were able to internalize a technology that they were collaborating on in the previous period.

Even though we have been able to test this method in multiple domains (3D printing, silica in rubber, 5G) and we are convinced of its value, there is an aspect that requires further investigation. The closed strategy is purely identified on the structure, it is possible that the position of the firm remains the same, but the collaborators differ between periods. This should be addresses in further work.

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Nexus between strategic thinking, competitive intelligence and innovation capability: Managerial support as a moderator

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ABSTRACT In a rapidly changing milieus, great support for innovation by top management team allows firms to sustain high market competitiveness both in the present and in the future. In actualizing this pursuit, strategic thinking and competitive intelligence are seen as drivers for innovation capability. This study investigates the nature of relationships between competitive intelligence, strategic thinking, and innovation capability. It also explores the moderating role of managerial support on these associations. In this study, a sample of 327 top and middle-level managers' responses to a survey was obtained from Nigerian Information Technology firms, using a judgmental sampling technique. The data were analyzed with Partial Least Square Structural Equation Modeling (PLS-SEM), using the SmartPLS software. The findings revealed that competitive intelligence and strategic thinking have an imperative direct and positive impact on innovation capability, and managerial support impacted positively, by meaningfully strengthening the relationships within the Nigeria context. The study mades significant contributions to the literature in terms of model development, which depicts the joint influence of competitive intelligence and strategic thinking with a moderating effect of managerial support. If deficient, this may result in inefficiency in achieving innovation capability among IT firms.

KEYWORDS Competitive intelligence, innovation capability, managerial support, PLS-SEM, strategic thinking

1. INTRODUCTION

In today's innovation-driven economy, understanding how to generate prodigious ideas is a pressing managerial priority. Initiating innovations is mostly a task handled by senior managers within an organization. Strategic thinking (ST) and competitive intelligence (CI) are used in creating novel and rational decisions relating to the past, present, and future, in areas of value addition and overall performance. Strategy aids the discovery and execution of novel ways of stimulating innovation capacity and sustaining competitiveness. In an intricate, widespread competitive environment, the uncertainty and turbulence of the contemporary world of business demands that organizational leaders and managers think strategically by responding to changes and developing an innovative model for business survival and sustainability (Haycock, 2012). ST and action have become increasingly

important within a new global environment, in which successful leadership requires a vision (Bouhali, Mekdad, Lebsirc and Ferkhad, 2015).

ST is among the expertise needed by managers. If it is not applied, there is a missing link in a business's performance (Srivastava and D'Souza, 2019; Emereole and Okafor, 2019; Bonn, 2001). ST is a modern and fundamental strategic management tool used in handling, forestalling, and proffering solutions to corporate challenges (Kettunen et al., 2020; Nickols, 2016). It can also be seen as the ability to examine and analyze the organizational external and internal environment, by foreseeing future opportunities and risks, as well as formulating alternatives and possibilities. It thereby organizes programs by absorbing opportunities and preventing risks (Olaleye et al., 2021; Hunitie, 2018). In addition, ST can also help a firm in discovering new strategies that can help in shaping competitive strategies (Dixit, Singh, Dhir, and Dhir, 2021)

Meanwhile, CI is a corporate strategy that assists firms in the managerial course of increasing performance via enhanced knowledge, internal communications, and strategic plans quality. The Society of Competitive Intelligence Professionals (SCIP, 2009) defines CI as a systematic and ethical program for gathering, analyzing, and managing any combination of data, information, and knowledge vis-à-vis the business milieu in which a company functions, and accommodates a substantial competitive advantage and enabling profiting decisions. CI's real value is to provide managers with the organizational tool to learn what the competitor will do, not what the competitor has already done.

Innovation capability is the "firms' ability to absorb, adapt and transform a given technology into specific operational, managerial and transactional routines that can lead to a Schumpeterian profit, that is, innovation" (Zawislak et al., 2012). Consequentially, innovation accrued benefits from intelligence processes, accrued to newly-provided knowledge, recognized novel opportunities, and enlarged technological paths of the external environment (Cainelli et al., 2019). Among existing firms, innovation performs vital roles as it strategically strengthens the technology-based prospect of the enterprise, with the sole aim of evolving and taming new products and processes.

Innovation is delineated as the espousal of ideas or conduct that is novel to an organization (Olaleye et al., 2021; Daft, 1978; Damanpour & Evan, 1984). Innovativeness is a procedural launching, with idea generation and development, towards extemporizing new products, services, and processes (Olaleye et al, 2020; Ainul, Hasliza & Noor, 2015; Bates & Khasawneh, 2005). All types of organizations are incapacitated with innovation, irrespective of their sizes since it is proven that innovative organizations tend to realize higher profits and market share (Prajogo & Ahmed, 2006). Hence, innovation capability (InC) is a firms' fundamental strategic asset to sustain competitive advantage (Ponta et al., 2020).

Various studies have examined ST as an antecedent (Kula and Naktiyok, 2021; Olaleye et al., 2020; Adelekan, 2020; Emereole and Okafor, 2019; Ibrahim and Elumah, 2016; Zahra and Nambisan, 2012), while few studies have analyzed the role of ST as a mediator or moderator (Bani-Hani, 2021; Alqershi et al, 2021; Fahmi et al., 2020) and even fewer studies have examined the impact of ST on InC (Rastgar, Arefi, and Hizji, 2017). Equally, studies have examined the role of CI on competitive advantage (Dixit et al., 2021), Bani-Hani, 2021), organizational performance (Irenaus, Ikechukwu & Ndubuisi, 2021), innovativeness (Olaleye et al., 2020; Hussein, Farzaneh, & Amiri, 2011), innovation performance (Poblano-Ojinaga, 2021; Caloof and Sewdass, 2020) and strategic human resource management (Alomari, 2020).

In response to gaps in research, this study proposes a new model on connection linking ST and CI to Nigerian IT firms' innovation capacity. Since the joint connection between ST, CI, and firms' InC is yet to be widely investigated, the study will attest to situational strengths that affects the relationship of the variables, and equally, add the moderating effect of managerial support (MGS) to the framework.

Following the prior discussions, this study attempts to answer the following research questions:

RQ1. Does ST impact InC among IT firms?
RQ2: Does CI impact InC among IT firms?
RQ3: Does MGS moderate these relationships?

2. THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

2.1 Strategic Thinking and Innovation Capability

Strategic thinking is a crucial module in the change management process, where alternate strategic methods are combined, bearing in mind vital decisions on the organizational value-creating process. Bonn (2001), stated that ST is seen as the cognitive process, preceding designing of strategies, whereby an individual contemplates organizational long-run developments, considering its historical and extant qualities, and the external veracities of its operations.

Alqershi et al. (2021), defined ST as the "organization's ability to create and develop a strategic vision by exploring all potential future organizational events and challenging traditional thinking to promote sound decision-making in record time". Nuntamanop et al. (2013), described ST as managerial required competency comprising conceptual thinking, visionary thinking, creativity, analytical thinking, learning, synthesizing, and objectivity. Garratt (2003), cited ST as an organizational procedure established by executives in meeting daily contests of managing and providing cogent alternatives into a dynamic business environment in actualizing managerial efficiency.

ST is an inevitable capacity procedure to support managers in evolving better strategies and inspiring employees to collaborate in innovative tactics which aid a firm's survival (Olaleye et al., 2020). Also, ST is a process that encourages creative and innovative thinking to overcome the dynamic and often unpredictable difficulties encountered in today's economy (Haycock, Cheadle & Bluestone, 2012; Kula and Naktiyok, 2021). ST helps businesses to understand the present and be prepared for the future through scenario planning. Thus, it harmonizes various premises related to the future, which might be challenging.

ST can offer innovative solutions to complex problems in a turbulent and hypercompetitive environment, which has the potential to change the rules of the competition and depict the future (Zahra and Nambisan, 2012). ST can be described as a dynamic and innovation-oriented process, which aids in developing a clearer vision for managers, while responding to external changes. Therefore, decisions led by ST are expected to be creative, original, and change the rules in the competitive game (Heracleous, 1998; Tovstiga, 2013). As such, ST often requires reconciling competing premises about the future and the integration of differing views into a coherent unit. This integration requires creativity and intelligence. Nowadays, ST should not be assigned solely to top-level managers, since some inventions are traceable to middle and lower-level managers, as well as employees who relate with customers, suppliers, and other stakeholders. Since ST is viewed as a synthesizing activity that can be integrated into the formal organizational strategic planning process, it is developed in individuals across all levels of an organization.

Emereole and Okafor (2019) conducted a study on the impact of ST using strategic planning as a proxy on organizational effectiveness, as well as examining the effect of strategic leadership on organizational performance. This study centered on the telecommunication industry, where 64 employees were questioned. The chi-square result showed a tie between strategic planning and organization effectiveness at 0.05 significant level. However, it was concluded that strategic leadership has a significant and positive effect on organizational performance, indiciating that organizations needed to define their visions when engaging in the ST process.

Olaleye et al. (2020), explored the mediating role of absorptive capabilities on the relationship between ST and innovation performance of IT firms in Nigeria. 182 senior-level and mid-level managers were questioned, and pragmatic evidence revealed that top-level managers in the IT industry in Nigeria are familiar with and implement ST. This enables them to understand the dynamic nature of firms in this ever-changing business era. However, it was concluded that improved innovative performance is attributable to ST competency among IT firms but the mediating role of absorptive capabilities was insignificant. Ibrahim & Elumah (2016), examined the effect of ST on firm performance within Nigeria's business milieu. Data was analyzed and it was found that a positive relationship exists between ST and firm performance, whereby managers were expected to be thinking strategically in order to obtain a large market share or competitive advantage in the market.

Therefore, the study presents the following hypothesis:

$H0_1$: Strategic thinking is assumed to have a positive influence on innovation capability

2.2 Competitive Intelligence and Innovation Capability

In designing a strategy of recognizing emerging trends and sustaining competitive advantage over rivals, the development of CI is a key management tool for corporate chief executives and policymakers. It is necessitated in the system, which tends to provide companies with new ideas in predicting the future, and also accepting changes more readily. Thus, due to increased competition, competitor intelligence has become a valuable analytical tool in the strategic planning process.

CI is defined as actionable recommendations arising from a systematic process, involving planning, gathering, analyzing, 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 focused primarily on how to understand the surrounding competitive environmental impacts on organizations, by gathering information to make relevant and better decisions (Maune, 2020). Hence, CI enables managers in companies of all sizes to make decisions on marketing, research, investments, and long-term business strategies.

CI assists businesses in numerous ways, ranging from the creation of new concepts, products, opportunities, and markets, as well as the positioning and launching of new products, processes, or services. It also includes the generation of new ideas, the tracking of trends, mergers, and acquisitions and the formulation of strategies. Meanwhile, this conforms to a study conducted in Iran on the effect of CI on innovativeness, which revealed that CI usage leads to innovation and organizational survival (Hussein, Farzaneh, & Amiri, 2011). This finding is also corroborated by a study on small establishments in Canada, showing a clear relationship between CI usage and innovative performance (Tanev & Bailetti, 2008).

Caloof and Sewdass (2020) explained that among studies conducted on CI and innovation, theoretical studies surpass empirical studies. They explored literature using a review approach that established significant relationships between various CI processes and structure variables, mostly related to innovation. From this, researchers were guided to conduct future work on causal statistical approaches to this relationship.

Rastgar et al. (2017) used questionnaires for the first time in measuring organizational innovation in Iran based on a survey made by the Organization for Economic Co-operation and Development (OECD). Results depicted those features of CI on organizational innovation. ST has also been effective as a mediator in 66 percent of their relationships.

It is well established within management practice and among relevant scholarly communities that CI is a skillset crucial to the success of organizations and individuals (Olaleye et al., 2021; Michaeli and Simon, 2008; Global Intelligence Alliance, 2007a; Wright et al., 2002). Furthermore, Irenaus, Ikechukwu, and Ndubuisi (2021) researched CI and organizational performance among SMEs in the southeast of Nigeria. The degree of the relationship between technology intelligence, strategic partnership, market intelligence, and financial performance indicators such as return on investment, return on sales, and market share was examined with a sample size of 318. All the hypotheses they tested had a positive significance on financial performance, and a recommendation was put forward that all employees should have rudimentary values and an understanding of CI.

Tanev and Bailetti (2008), focused on the nexus between intelligence activities and innovation in technology firms and concluded that CI results in the creation of innovativeness in small businesses. Both small and large organizations in the western hemisphere and East Asia deeply applied CI as a basis for competitive advantage and innovativeness (Adidam, Banerjee, & Shukla, 2012; Smith & Kossou, 2008; Wright, 2011). A review by Hussein, Farzaneh, & Amiri (2011) showed a positive relationship between CI and innovative performance. Consequently, on the assumption of understanding CI's role in promoting InC, the following hypothesis is proposed:

$H0_2$: Competitive intelligence positively influences innovation capability

2.3 Moderating Role of Managerial Support and Innovation Capability

Managerial support is viewed as a commitment from organization administrators, considering some pressing and uncontrollable circumstances of their employees that require attention towards their development in achieving better performance. It can also be

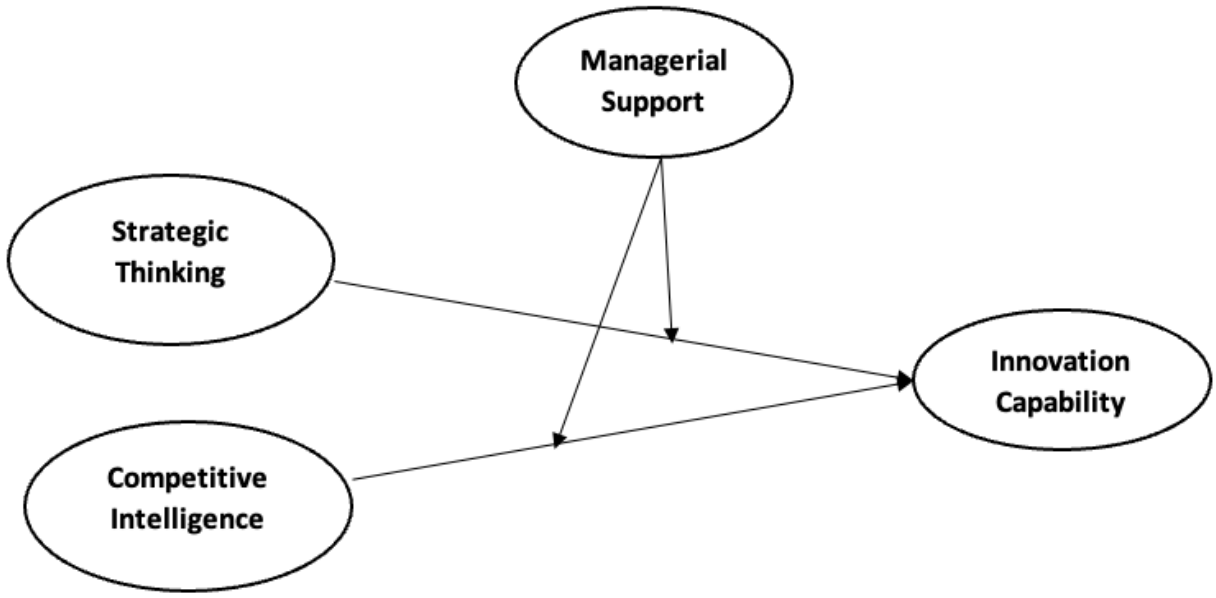

Figure 1 Research model.

defined as "the degree to which employees form general impressions that their managers appreciate their contributions, are supportive, and care about their subordinates' well-being" (Eisenberger, Stinglhamber, Vandenberghe, Sucharski and Rhoades 2002).

Nowadays, business administrators categorially put in place CI activities, whether performed formally or not. CI could be viewed as either a process or a product, which is acquainted with creating innovation of any manner. Meanwhile, firms with well-developed innovation capabilities stand a better chance to sustain their competitiveness. Additionally, managers who have ST skills need the information to interpret the dynamics of the competition correctly, to predict their competitive positions, and to determine their competitive positions correctly. These innovative ideas make them distinct.

Innovation in IT inventions has immensely contributed to the enhancement of organizational performance and the feat of competitive advantage for organizations within developed and developing countries (Niebel, 2018). Besides the dissimilar needs of studies, factors elucidating the creation and development of innovation capacities could be common, but their relative importance is inconclusive.

CI is less frequently applied due to its newness. It is strategically focused, requiring an expertise role in reducing its prevalent usage by top-level managers. CI is considered an imperative based on its positive impact on the economic environment, to retain its continuous flow of innovations and technological advances in exercising pressure on all competitors (Fagerberg & Srholec, 2008).

In a study conducted by Kula and Naktiyok (2021), the impact of ST skills on CI by executives was examined. The idea of ST epitomizes a knowledge of ST dimensions: system thinking, creativity, and vision dimensions. In contrast, CI was evaluated based on its context and process. Data were obtained from 628 executives from the automotive and communication industries. Based on the results, ST has a positive and significant effect on CI. Hence, the study greatly contributes to the literature on the connection between ideas of strategy and competition through the interaction of ST and CI.

However, studies in the literature do not address if managerial support plays a moderating role in the relationship between ST, CI, and InC. Therefore, the following hypotheses are proposed:

H3a: the relationship between strategic thinking and innovation capability is positively moderated through management support

H3b: the relationship between competitive intelligence and innovation capability is positively moderated through management support

A research model for all testable hypotheses stated above is depicted in Figure 1.

3. METHODOLOGY

3.1 Study Area, Research Design, Population, and Sample Size

This study centered on Nigerian IT firms, since the sector has promising contributions to the nations' GDP, as declared by the Federal Government of Nigeria (Pantanmi, 2021). IT companies were assembled using the directory of recognized sectoral and national bodies including: the Nigeria Computer Society (NCS), the Information Technology Association of Nigeria (ITAN), and the National IT Development Agency (NITDA). The study involved a quantitative cross-sectional research design. All-inclusive information and understanding regarding the prevailing subject of discourse was elicited from CEOs and Senior Managers occupying top and mid-level managerial positions in the IT firms, using a well-structured instrument adapted from the extant literature. A combined non-probability sampling technique using purposive and convenience was used since the criteria for selecting sample units and participants was already known. The study proposed a sample size of 260 for a population of 800, using the program G*Power, version 3.1.9.2, with an error probability of 0.05 (Faul et al., 2009).

3.2 Measures

InC encompasses a firms' skills, knowledge, and procedures to transform identified knowledge into technology and business (Zawislak et al., 2012). A five items scale was adopted from Robledo et al. (2010) and Lugones et al., (2007). ST was captured using a ten items scale derived from three dimensions: system thinking, divergent thought, and reflection (Liedtka, 1998 and Napier and Albert, 1990). Meanwhile, CI and management support were modeled and captured with seven and five items, respectively (Stefanikova et al., 2015; Dishman and Calof, 2008; Allen and Meyer, 1990). Responses to all items were measured on a five-point Likert scale ranging from 1 "strongly disagree" to 5 "strongly agree".

3.3 Data Analysis

The analytical procedure deployed in this study comprises both descriptive and inferential statistics. SPSS was used in describing the sample population frame in terms of frequencies and percentages. The proposed structural model was subjected to strings of psychometric and multi-collinearity tests, with confirmation by the Partial Least Square Structural Equation Modeling (PLS-SEM) using SmartPLS version 3.0. Significance levels and their path coefficients were examined using the bootstrapping method.

4. RESULTS

4.1 Response Rate and Descriptive Analysis

Out of 800 surveys administered within 16 months, 401 were returned, 74 responses were deleted, while 327 were valid for the study, implying a 40.8 percent response rate. Descriptive statistics described the socio-economic characteristics of the respondents, and also defined whether or not the selected respondents are appropriate for the study.

Table 1 Demographic profile of the respondents. Source: Computations from Survey Data, 2020.

Demographics	Parameters	Sample (n=327)	
		Frequency	Percentage
Gender	Male	214	65.4
	Female	113	34.6
Educational Qualification	Bachelor	106	32.4
	Masters (MBA/MPA/MSC)	193	59.0
	Doctorate	28	8.6
Working Experience	Below 5 years	41	12.5
	5-10 years	129	39.5
	Above 10 years	157	48.0
Job Position	Chief Executive Officer (CEO)	211	64.5
	Director	67	20.5
	Supervisor	49	15.0

Table 2 Measurement model. Note: *** = p < 0.01. –* discarded items during confirmatory factor analysis.

Constructs and Indicators		*Loadings (λ)*	Mean	Std. Deviation	Skewness	Kurtosis
Competitive Intelligence	CI1	0.825***	3.548	0.836	-0.411	-0.478
	CI2	0.820***	3.469	0.816	-0.275	-0.387
	CI3	0.815***	3.557	0.880	-0.590	0.274
	CI4	0.828***	3.648	0.806	-0.388	-0.094
	CI5	0.807***	3.622	0.825	-0.362	-0.368
	CI6	-				
	CI7	-				
Strategic Thinking		*System Thinking*				
	ST1	0.819***	3.598	1.075	-0.655	-0.407
	ST2	0.824***	3.660	1.219	-0.507	-0.899
	ST3	0.857***	3.557	1.286	-0.476	-0.973
	ST4	0.868***	3.648	1.164	-0.642	-0.502
		Divergent Thought				
	DT1	0.876***	3.469	1.183	-0.311	-0.919
	DT2	0.876***	3.768	1.084	-0.667	-0.238
	DT3	0.821***	3.712	0.993	-0.644	0.167
		Reflection				
	RX1	0.841***	3.331	0.866	-0.070	-0.435
	RX2	0.867***	3.455	1.031	-0.401	-0.655
	RX3	0.840***	3.481	1.035	-0.587	-0.266
Managerial Support						
	MS1	0.889***	4.012	1.149	-0.932	-0.251
	MS2	0.888***	3.669	1.178	-0.522	-0.763
	MS3	0.818***	4.076	0.984	-0.970	0.202
	MS4	-				
	MS5	-				
Innovation Performance						
	InC1	0.784***	3.349	1.063	-0.130	-0.879
	InC2	0.841***	3.243	0.936	-0.072	-0.735
	InC3	0.806***	3.543	0.979	-0.695	-0.106
	InC4	0.809***	3.208	1.028	-0.247	-0.764
	InC5	-				

The study sample comprises 327 top-level and middle-level managers of IT firms in Nigeria. Out of this sample, male respondents accounted for 65.4% of total responses obtained, while 34.6% are female, this indicates that there is gender equality among IT firms' administration in Nigeria. Distribution based on academic qualification evidenced that majority (59%) possess a master's degree, closely followed by those with bachelor certificate (32.4%) and the least were those with their doctorate (8.6%). On average, the majority of the respondents are highly knowledgeable and experienced with 48% having served for more than 10 years, next was 5-10 years with 39.5%, and the least proportion (12.5%) had less than 5 years of experice. Finally, the job position indicates that 64.5% are the CEOs (sole owners), closely followed by 20.5% occupying the position of director and the lowest number (15%), employed as supervisors.

4.2 Measurement Model

The results of the measurement model are presented in Table 2, using the Partial Least Square Structural Equation Modeling (PLS-SEM) to the evaluation of the psychometric properties of the constructs: ST, CI, managerial support, and InC. In assessing the measurement model as hypothesized, all constructs associated with latent variables are subjected to a psychometric test. The test entails the outer loadings, Average Variance Extracted (AVE), Composite Reliability (CR), Cronbach's alpha (CA), rho_A values, and convergent validity of items related to their constructs (Hair et al. 2017).

To improve the best model fit indices, scale items with poor loadings below 0.4 were deleted. This included one item from InC, and two items each from CI and MS. Thereafter, all retained items documented outer loadings above 0.5, as suggested by Lin & Wang (2012), while values of CR, CA, and rho_A exceed the

0.7 threshold. This affirms the presence of convergent validity in the measurement model (Dijkstra & Henseler 2015). Since all the AVEs are above the threshold, the entire measurement shows an acceptable fit and high predictive power.

The discriminant validity among the variables is also recognized following the Fornell-Larcker criterion (1981), the square root of AVE (represented diagonally in bold format) for each latent variable is higher than the inter-construct correlation for each construct in the measurement model depicted in Table 3. Furthermore, critiques made on the reliability of Fornell-Larcker's (1981) criterion led to the alternative proposed technique, the Heterotrait-Monotrait (HTMT) ratio of correlations to demonstrate its superiority over the Fornell and Larcker (1981) approach (Henseler *et al.*, 2015). As observed in the table, the HTMT values shown in italics right above the square roots of AVE in diagonal that all the constructs in our measurement model are below the thresholds of 0.9, as recommended by Kline (2005). This affirms a definite discriminant validity existence among variables in our model.

4.3 Structural Model Assessment

In assessing the hypothesized relationship between constructs as depicted in the model in Figure 2, R-squared values, the beta (ß) coefficients, and t-values obtained from bootstrapping using 2,000 subsamples and effect sizes (f2) are being examined as recommended by Hair et al. (2019). Firstly, the direct effect of the predictor on the dependent variable is analyzed and the result showed that ST had a positive effect on InC (ß = 0.231; t = 2.771). It also proved the second hypothesis is significant, showing that CI positively influences InC (ß = 0.366; t = 7.085). To test the moderation effect contained in hypothesis three, the result of the moderation analysis shows that MS positively moderate the relationship between ST and InC (ß = 0.155, t=3.002, p< .001), likewise, the path between CI and InC (ß = 0.123; t = 2.442). However, all hypothesized paths in the study model are supported and the coefficient of determination (R-squared) shows the combined effects of exogenous latent variables were considered to be moderate with an R2 value of 0.310. Subsequently, to observe the beta coefficients (ß), statistical significance (P-value), and variance explained (R2), Sullivan & Feinn (2012), recommend that the substantive significance (f2), be reported to reveal the actual magnitude of the observed effects. The effect sizes of the direct and indirect paths are recorded in Table 4. Relying on the magnitude of effect sizes, three paths including the moderating path (STR→InC; MOD_MS*STR→InC; MOD_MS*CI→InC) recorded low effect sizes, since the f2 fell within the limit of 0.02 - 0.15 as suggested by Cohen (1988), while the effect size of CI on InC was moderate (f2= 0.173), hence none had insignificant magnitude.

Considering the overall goodness-of-fit (GoF), which can be accessed via tests of model fit or the use of fit indices, indicators like the SRMR and normal fit index (NFI) become significant, if the SRMR is less than 0.08 and NFI fell within the range of 0 and 1. Hence, the study model is said to be statistically fit (SRMR= 0.072; NFI = 0.907) as evidenced by Henseler, Hubona, and Ray (2016).

Table 3 Inter-construct correlations, Convergent and Discriminant Validity. Notes: [a]= Diagonal values in bold are the square root of AVE, [b]= Italicized values above the square root of AVE are HTMT ratios.

Constructs	**CA**	**Rho**	**CR**	**AVE**	**CI**	**InC**	**MS**	**STR**
Competitive Intelligence	0.877	0.879	0.911	0.671	[a]**0.819**	[b]*0.526*	*0.225*	*0.309*
Innovation Capability	0.826	0.830	0.884	0.657	0.454	**0.810**	*0.385*	*0.435*
Managerial support (MS)	0.832	0.835	0.900	0.749	0.191	0.325	**0.866**	*0.886*
Strategic Thinking (STR)	0.921	0.922	0.934	0.586	0.278	0.385	0.772	**0.765**

Table 4 Results of the Path Analysis. Note: ***p < 0.05 (based on two-tailed test).

Hypothesis	***Model Fit Indices:*** *SRMR= 0.072; NFI = 0.907 d_ULS = 3.928*					
Direct Effects	***Std. Beta***	***t-value***	***P-values***	***f ²***	***R²***	***Decision***
H1: STR→InC	0.231	2.771***	0.006	0.038	0.310	*Supported*
H2: CI→InC	0.366	7.085***	0.000	0.173	0.310	*Supported*
Interaction Effects (Moderation)						
H3a:MOD_MS*STR→InC	0.155	3.002***	0.003	0.029		*Supported*
H3b: MOD_MS*CI→InC	0.123	2.442***	0.015	0.023		*Supported*

Table 5 Latent Construct Prediction Summary. Note* RMSE = Root Mean Squared Error, and MAE = Mean Absolute Error.

	RMSE	MAE	Q^2_predict
Innovation Capability	0.522	0.403	0.108
Strategic Thinking	0.237	0.182	0.952

Finally, the predictions of the outcome variable in the study model were examined, using the PLS predict functionality in SmartPLS. The predictive validity involved cross-validation and generation of predicted errors and error summary statistics, which include the root mean squared error (RMSE), the mean absolute error (MAE), and the mean absolute percentage error (MAPE) (Shmueli et al., 2016). The PLS predict analysis yielded Q^2 values for each of the constructs: InC (0.952), STR (0.108). Hence, the positivity of the Q^2 value denoted that the model is adequately established, and valid in predicting the exogenous latent construct.

5. DISCUSSION AND THEORETICAL CONTRIBUTIONS

Today, managerial precedence focuses on idea creation, which is a result of an innovation-driven economy, especially within the business world. This study provides empirical evidence for the proposed theoretical relationships in the framework, confirming the significant relationships, both direct and indirect. The evidence highlights the role that MGS plays as a moderating variable on the relationships between the STR, CI, and IT firms' InC.

First, the question of the relationship between ST and InC is addressed with the three dimensions of ST: system thinking, divergent thought, and reflection. The findings show a significant relationship between STR and InC, supporting Kalu and Naktiyok (2021) and Zahra and Nambisan, (2012). Consequently, it can be deduced that managers engaged in IT organizations possess ST skills since the industry involves originations which tend to satisfy demands in the changing environment.

ST competency has been shown to also contribute to the positive outcomes on InC. A firm's innovation performance solely depends on hypothetical intellects and strategic plans made by visionary and strategic leaders in predicting the future, and implementing

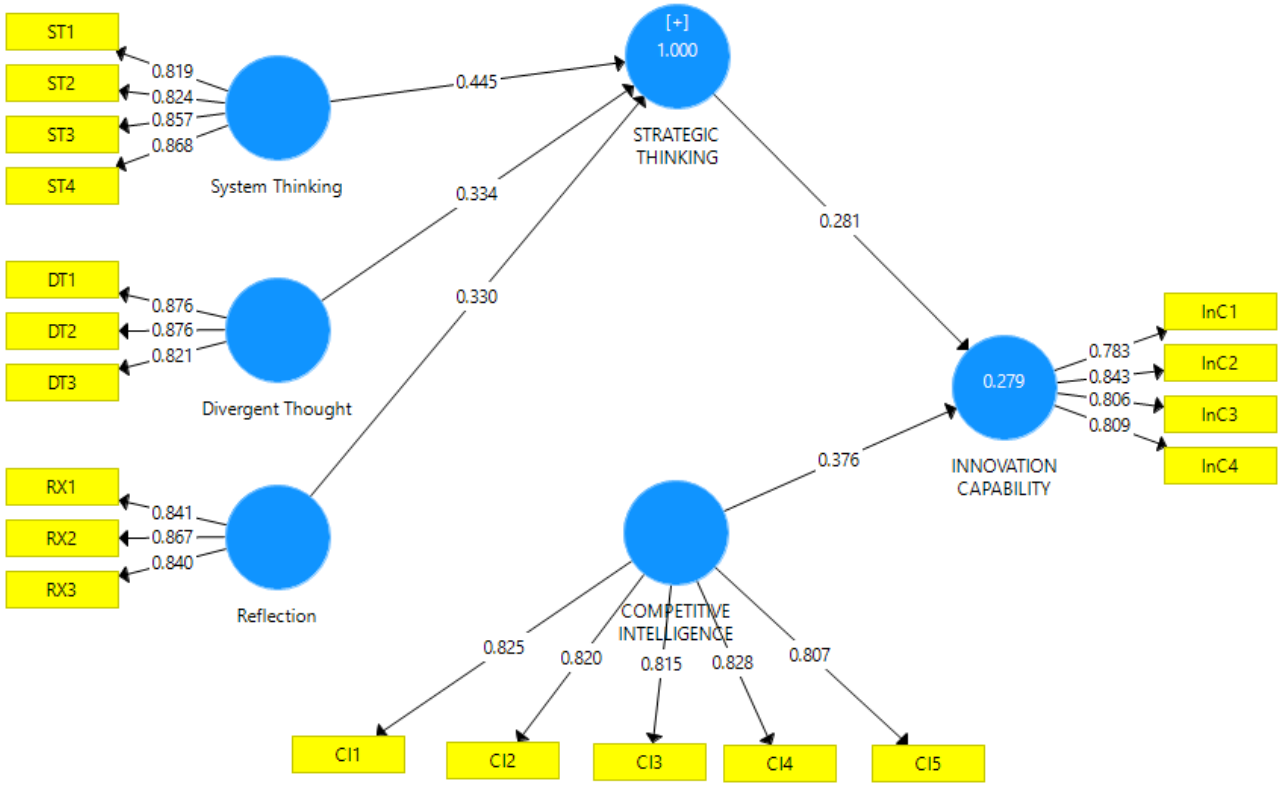

Figure 2 Structural model (direct path).

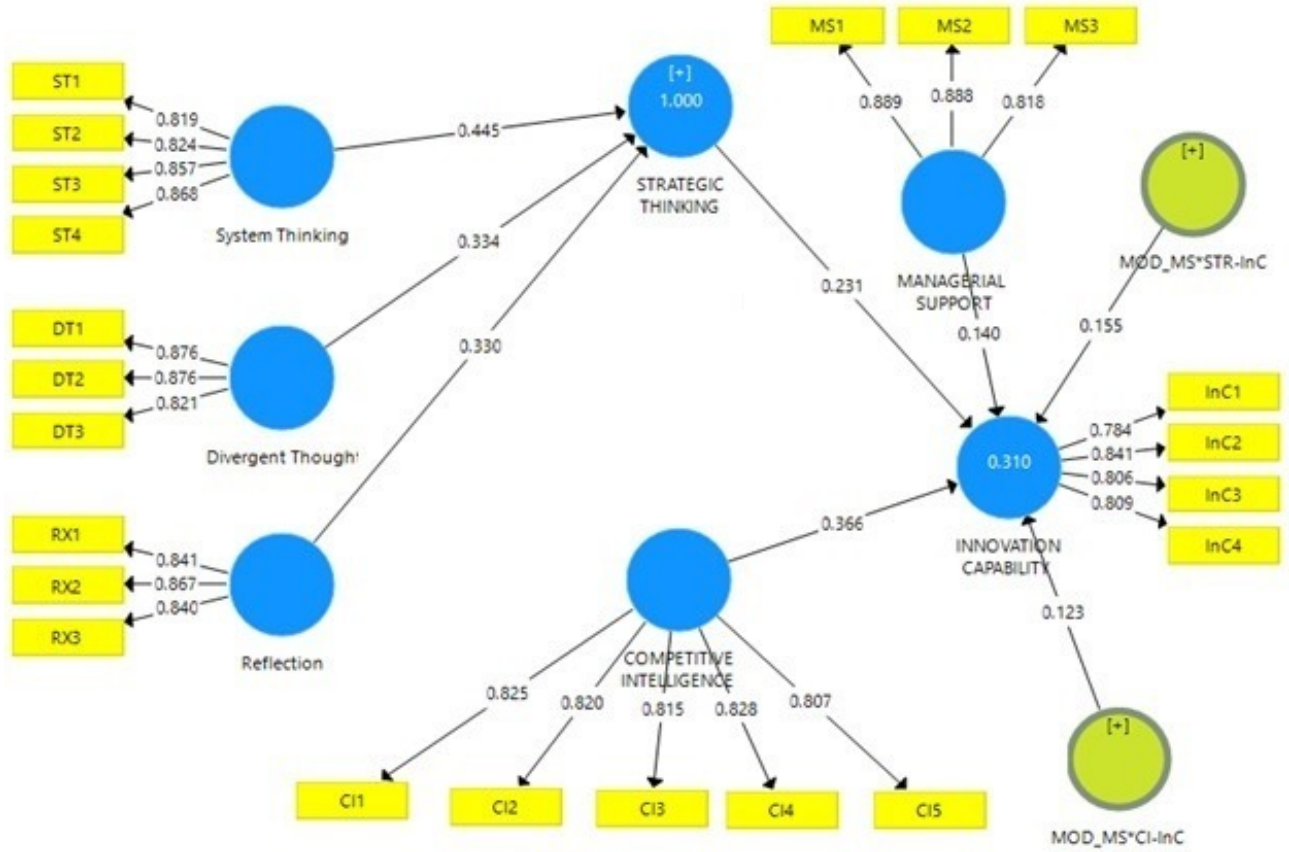

Figure 3 Final PLS structural model (with moderator).

planned scenarios in gaining a competitive advantage over rivals. Strategic thinkers have diverse obligations, ranging from creating strategic plans, monitoring market trends, and continuously outwitting competitors in market performance, using tools such as PESTLE analysis, Porter's Five Forces, McKinsey 7S model, and SWOT analysis.

Secondly, the result revealed that CI is directly related to, and had a positive impact on, InC. This result validates Caloof and Sewdass (2020) and Ainul et al. (2015), who established a strong effect between CI and innovation. In support of the findings, Hussein et al. (2011) and Tanev and Bailetti (2008) reported that CI results in innovativeness, thereby enhancing innovative performance among SMEs. Also, strong support was given to the reasoning by Petrişor and Străin (2013), Jaworski, Macinnis, and Kohli (2002), and Krücken-Pereira, Debiasi, and Abreu (2001) that CI serves as a strategy to develop and innovation capacity. Meanwhile, Poblano-Ojinaga, (2021) mentioned that no direct effect exists between CI on InC, emphasizing the repute of integrating an intervening variables, such as knowledge management, to obtain better results in serving as a source of competitive advantage for operating firms

The significance of CI's influence on InC conforms to the definition of Wright, Fleisher, and Madden (2008) in Muritala and Ajetunobi (2019), viewing CI as a process in which an organization amasses information about competitors and the competitive environs, to be used in forecasting decision makings with the intent of improving performance. Hence, this is actualized with actionable intelligence made through critical thinking, reflection, and principled evidence gathered from the competitive environment. This in turn is processed and further analyzed to aid decision making. Hence, CI is empirically proven to increase innovative performance in Nigerian IT firms.

From the result presented, Figure 3 shows an R-squared value of 0.279, while the inclusion of the moderator (MGS) caused a change in the R-squared value to 0.310 (see Figure 4). Hence, this implies that an upward shift in the value of R-squared is accounted for by the combined effects of exogenous latent variables, in which the intervening variable, MGS, is strongly embedded through its positive co-efficient.

Several studies explore the CI effect on innovation performance, as well the effect of ST on innovation performance. A study on the dual

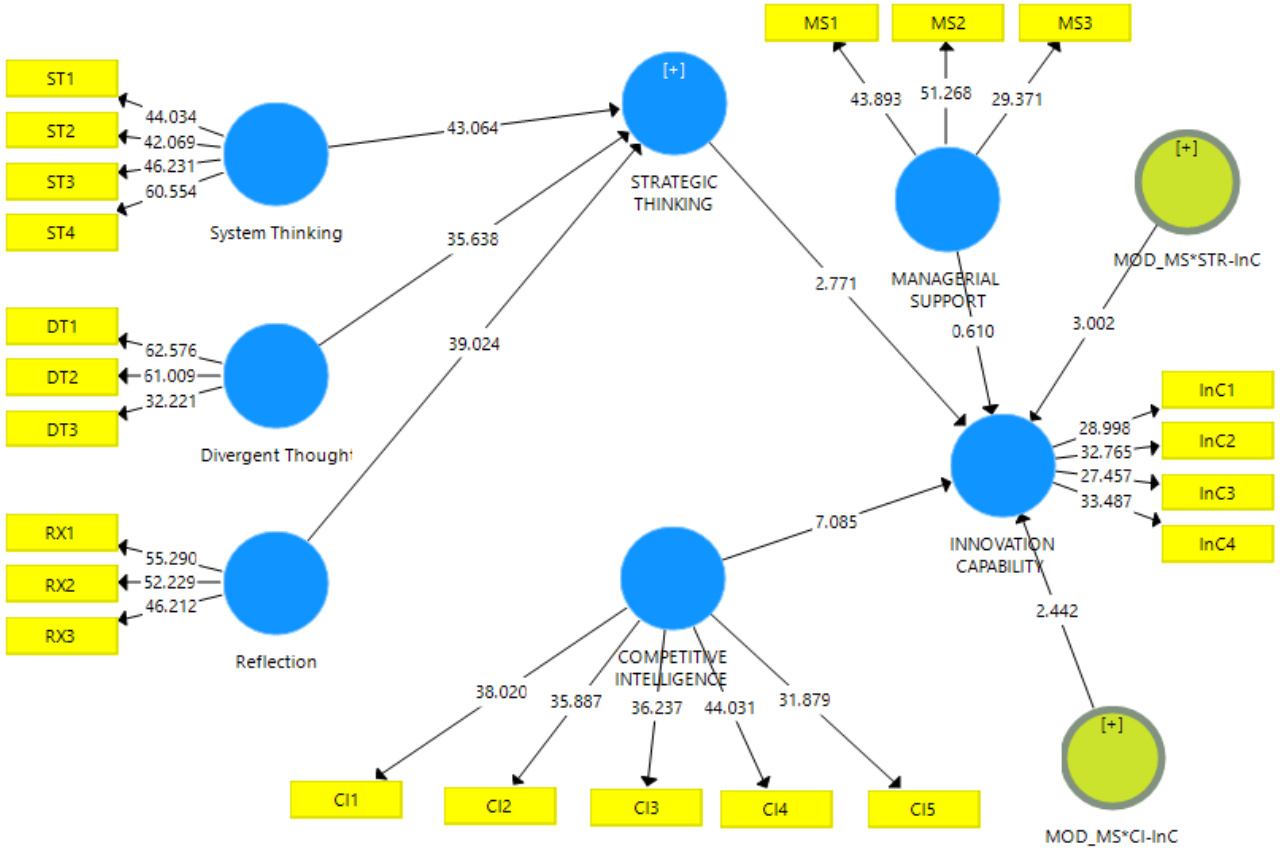

Figure 4 T-test statistic.

effect of CI and ST on innovation was carried out by Rastgar, Arefi & Hizji, (2017). The novelty of this study owes to factors including the industry type, continent (country), and intervening variable, which is the "managerial support" playing a moderating role. Such moderating effect is one of the unique contributions of this study, as it supports the proposal that SMGS has a role in the relationship between ST and IT firms' InC, confirming that management support to the firm enhances innovation. The study found CI to influence innovation capacity through the moderating role of MGS, this creates an irreplaceable input to IT firms, as evidence showed that managers who exhibit ST skills have a keen interest in depicting future situations and, as such, they tend to steer competition. Since business is driven by profit, to sustain competition, interests are not only protected but rather expanded in the area of outsmarting competitors with innovation capacity (Botha and Boon, 2008).

This study gives support to the proposal made by Rastgar et al. (2017) on the need to develop competition in business-driven companies, in awareness of environmental changes and innovation. Hence, CI is a basis of the innovation process, but a lack of ST in organizations causes inefficiency and ineffectiveness in achieving organizational innovation. Following debates on the significant and positive influence of ST on the capability of organizational innovation, management greatly supports this. This is done by encouraging all managers in charge of decision-making, as well as employees with satisfactory resources and strategies on developing, and implementing competencies on foresight and intelligence in the marketing conduct of the organizational not minding cadres of personnel.

6. CONCLUSION

The study establishes positive relationships between the ST competency and its sub-constructs of systemic thinking, divergent thought, and reflection, as well as one of business capability with CI to stimulate InC with support from top management teams of IT firms in Nigeria.

Notably, in the literature, academia has dealt with the relationship between ST and innovation performance, as well as CI influence on innovation performance. There has been less focus on the nexus between these constructs, via a best of fit research model,

including the feat of management support on this strategy for developing organizational capacity. Thus, this remains an novel contribution to scholarly discourse.

Overall results of the present study proved that the management team's support for ST and careful intensification on CI serves as an imperative strategy to achieve increased organizational InC. The conclusion is drawn that through support from the management team, and influence on the link between ST and CI, Nigerian IT firms, and their dynamic economy will be innovation-driven.

6.1 Policy Implications for Management

A few practical implications are deduced from this study, which remains valuable to managers and the top management team in place of rationale decision on the aptness of innovation type and capacity, to enhance performance. CI is relevant in today's global environment since it entails the creation of a thoughtful idea, which level managers strategically make future predictions upon. In this study, it is implicitly stated that managers who have ST skills can use their CI skills more effectively, as this tends to increase the innovation capacity and performance of the organization.

The present study provides consistent results with the ST and CI literature on innovation capacity. This owes to the fact that managers can create a supportive competitive culture at a certain level by giving importance to ST, by ensuring their contributions to the long-term goals of the enterprise and to the extent of convincing workforces in actualizing the need for innovativeness and viewing it as a corporate objective to be realized. Finally, results depict that innovation benefits from intelligence processes and the proactiveness of management in support for this tactic. This can be done through periodic strategic training and orientation of employees and better diffusion of innovation capacity as a core capability. Connecting with systemic thinking and divergent thought will keep the creative vision of operations alive, and result in better performance.

6.2 Limitations and future research

Despite the theoretical and empirical contributions presented by this study, some confines should be acknowledged. First, the study results may not be generalized with other industries and should be interpreted in the context of the industry and changing business dynamics. Future research using multiple industries will provide a fruitful comparison of the relationship between ST, CI, and InC. It will also help in understanding the relationship between ST and types of intelligence such as market intelligence, technological intelligence, corporate and strategic intelligence. The study is cross-sectional, which made use of a survey in obtaining information from the respondents. Therefore, future research could also supplement the data collection method sections of the interview, making a mixed-method study, which could compensate for the strengths and weaknesses associated with particular methods. Future research must assess whether the alignment between ST and CI changes over time given a specific innovation capacity of the firm through, for example, a longitudinal study. Research could also be expanded to identify any leadership style that strengthens this association since ST is further allied with leadership obligation. Finally, since no strategy is required in an environment where there is no rival, the identified variables could be investigated as an antecedent of sustainable competitive advantage.

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Marketplace analysis of purchase decision factors for Instagram social media users

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ABSTRACT Currently, the role of technology, such as the internet, is very important to support human activities. One of the uses of the internet is as a medium to support online shopping. In addition, the existence of Instagram social media also affects consumers' decisions in online shopping. This study analyzes the purchasing decision factors of Instagram social media users on the marketplace. The variables used in this study are price, promotion, trust, security, Instagram social media users and purchase decision. The research framework was developed using the theory of reasoned action. The sample in this study is consumers who have done online shopping. A total of 200 questionnaires were distributed via a Google form, of which 102 were returned. The data analysis method in this study used Smart PLS 3.0. The results showed that all variables had a positive and significant relationship with online purchasing decisions. This research provides theoretical and practical implications. This study is useful for Instagram social media users to consider the factors that purchasing decisions in online shopping have on the marketplace.

KEYWORDS Instagram users, online shopping, price, promotion, purchase decision, security, trust

1. INTRODUCTION

From mid-February 2020 until now (2021), Indonesia was impacted by the Covid-19 virus pandemic, and because of this people have choosen to carry out more shopping online. The choice people have made to shop online is due to the activity policies set by the government (Prabawanti., 2020). During this pandemic, online shopping methods through social media have increased. In June 2020, Facebook researched the increasing trend of online shopping methods during the pandemic and found that shopping through social media increased by up to 37% compared to before the pandemic (Facebook, 2020). This indicates that people are more interested in shopping online during the pandemic for reasons of mental health and safety.

Based on data from the Ministry of Home Affairs, by early 2020, Indonesia's population was around 268.5 million, with internet users reaching 175.4 million and smartphone users amounting to 338.2 million people (twice that of internet users). In addition to the internet, several types of social media are often used. By January 2020, there were 160 million social media users in Indonesia (Wearesocial, 2020).

The most popular social media are Facebook, WhatsApp, YouTube, Twitter and Instagram, and many more. Based on data from Wearesocial in 2020, the most popular social media used is YouTube at 88% of internet users in Indonesia, followed in popularity by WhatsApp, Facebook and Instagram (Wearesocial, 2020). Some of these social media have benefits for their users, such as providing entertaining, providing or sharing

information, communicating, or use in business matters.

One of the most popular social media platforms today is Instagram. The number of Instagram users in Indonesia in January 2020 was 63 million people with 50.8% female and 49.2% male (Wearesocial, 2020). The role of Instagram in the decision-making process in online shopping is as an intermediary or "bridge" before consumers make purchase transactions in the marketplace. The large number of Instagram users provides an opportunity for rapid economic growth in the digital sector. Some of the reasons people, especially women, do online shopping through Instagram, is because they follow the trends displayed in their Instagram feed and stories columns. Consumers are also influenced by prices of products that are offered even though they don't need them (Fauziah, 2018).

In addition, several factors determine the goods consumers will buy in online the shopping marketplace. A survey conducted by IDN Times in the 2019 Indonesia Millennial Report found that 60% of consumers chose price as the main factor in considering the products they would buy online, followed by features and promotional programs ranked second and third, respectively (IDN Research Institute.,2019).

In 2013, the International Journal of Engineering Research and Development released the results of research on the main factors influencing people who shop online. They found that trust is the strongest factor that influences online shopping decisions. Trust is an important factor that can influence consumers to buy products online (Mohmed, 2013). This research is reinforced by Nawangsari (2018) who finds that trust has a simultaneous effect on purchasing decisions.

Regarding the influence of Instagram social media on purchasing decisions, Fredik (2018) found that Instagram has a 33.2% positive influence on the promotion of product purchase decisions. Regarding the factors that influence peoples' decisions to shop online, the authors also found several results from previous research related to the analysis of peoples' decisions to shop online. The research proposed by Njoto (2018) found that promotions, namely advertising, sales promotion, and personal selling, have a significant effect on consumer purchasing decisions in the marketplace. Meanwhile, research from Lin Pan (2019) found that safety is the main factor in determining consumer purchasing decisions.

From several existing studies, it was found that there were no consistent results from the research, so this study intends to fill in the existing deficiencies. This research consists of several parts, starting from the background of the study, literature review, research methods, discussion of results, and conclusions.

2. LITERATURE REVIEW

2.1 Industrial History

In America, online marketplaces became popular in 1995 with the start of eBay and Amazon. In China, the online marketplace started to get crowded after Jack Ma founded Alibaba, which is now a giant marketplace. While in Indonesia, the beginning of online stores began in 1999 with the establishment of the Kaskus buying and selling forum. However, in the early days of online buying and selling forums, most people only used the platform to show their products. Meanwhile, the transaction process was still done offline. A few years later, Tokobagus.com became OLX (Circle, 2020).

Currently, there are many marketplaces with the strengths of their respective industries and the choice of payment methods is also increasingly diverse. The transaction process that was previously limited to debit and credit can now be done via a smartphone. Some marketplaces even provide electronic wallets. This makes more and more consumers prefer to shop at online marketplaces because of the convenience they offers. This growth is said to be able to make e-commerce a major driver of the digital economy. It is predicted that the e-commerce market will account for USD 100 billion by 2025 (Tokopedia, 2019). The marketplace is a new business model that is developing along with the rapid development of information technology infrastructure. The marketplace is designed to minimize complex business processes to create efficiency and effectiveness. With a marketplace, everyone can carry out buying and selling activities easily, quickly, and cheaply because there are no limits on space, distance, or time. Conventionally, the market has several roles including facilitating transactions and providing infrastructure. Indicators of marketplace activity are determined by the marketplace's ability to facilitate transactions, bring together sellers and buyers, and provide infrastructure. The efficiency indicator is related to the conciseness of time and costs

provided by the marketplace (L. Alrubaiee, 2012).

According to Mulyaningsih (2015), There are several differences between a marketplace and e-commerce. In terms of product provision, the marketplace has many vendors/brands, while e-commerce comes from only one brand. Then in terms of the business model, the marketplace can use the B2B (Business to Business and B2C (Business to Customer) business model, while e-commerce only uses the B2C (Business to Customer) business model, registration of premium brands, and advertisements. Therefore, e-commerce income is derived exclusively from buying and selling transactions with customers.

In terms of payment, for a marketplace it depends on the brand's policy on the marketplace as a third party, while e-commerce payments are directly from customers. Regarding the process of shipping goods, for marketplaces, they are sent from the vendor/brand of the product provider, while e-commerce is sent from the same place and with the same method.

2.2 Theoretical Foundation

The basic framework of thought in this study uses the theory of reasoned action (TRA). This theory was developed in 1967. The theory was then continuously revised and expanded by Icek Ajzen and Martin Fishbein. Starting in 1980 the theory was used to study human behavior (Trafimow, 2009).

The TRA was formulated in 1967 in an attempt to provide consistency in the study of the relationship between behavior and attitudes. Reasoned Action Theory was developed to examine the relationship between attitudes and behavior (Trafimow, 2009). This theory explains that a person's behavior is influenced by intentions, while intentions are influenced by subjective attitudes and norms. Attitudes are influenced by beliefs about the results of past actions. Subjective norms are influenced by belief in the opinions of others and the motivation to obey these rules. Simply put, this theory says that a person will do an action if she or he views the action positively and believes that other people want them to do it (Kayati, 2018).

Some of the variables used in this study include price (X1) promotion (X2), trust (X3), security (X4), Instagram users (Y), and purchase decision (Z). So for the framework of thought can be arranged as in Figure 1.

2.3 Hypothesis Development

Based on several previous studies and referring to research variables, the following hypotheses can be developed:

2.3.1 Influence of price on purchasing decisions of Instagram social media users

An important concept for marketers is price. Pricing is a mechanism for obtaining value for the company. For consumers, price is the amount needed to get a product (Gecit, 2017). Price is an important factor in purchasing decisions, especially for frequently purchased products, and therefore influences the choice of

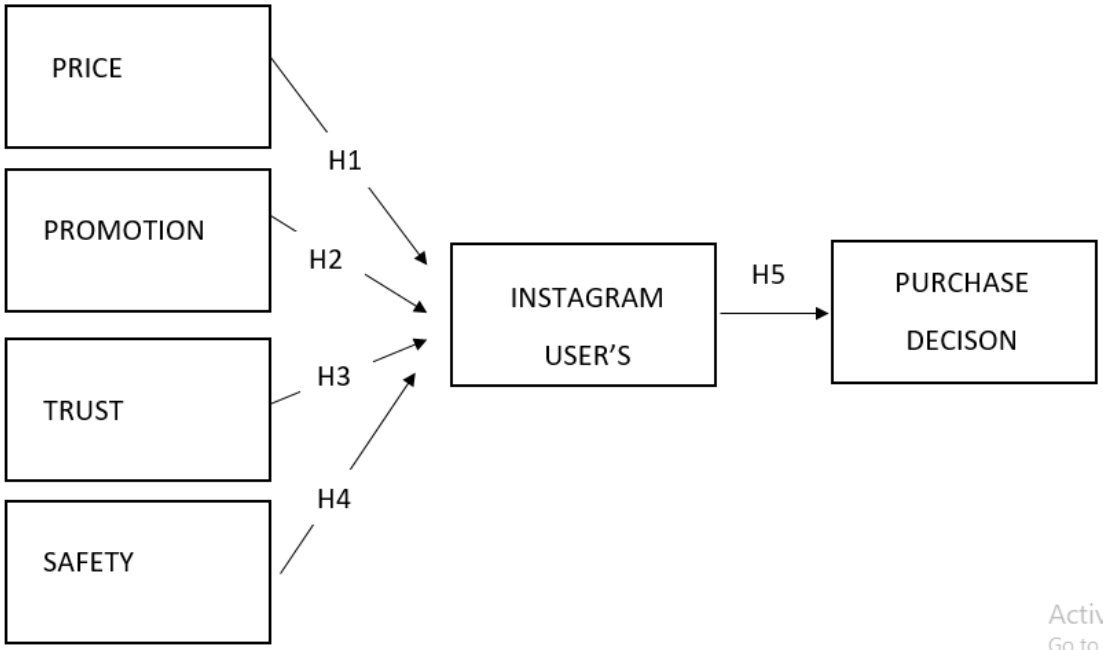

Figure 1 Research framework.

stores, products and brands to consider (Albari, 2018). Fair pricing refers to price adjustments that offer the right combination of quality and service at a reasonable price (Kotler and Keller, 2016). Many think that selling online is easier and more practical and economical because we don't need a store or a lot of human resources to do a business. It is enough with gadgets, credit for the internet and individual creativity to attract buyers. However, it turns out that running an online business is not as easy as many people imagine or predict. In reality doing business online turns out to have many obstacles related to competitors (because many people also do business online) and precisely because it is online, people find it easier to compare prices with one another (Gain., 2017). Prices are set by the seller under the quality and service provided. Price is also the most visible element of the marketing mix, and pricing policies are often questioned by consumers. If consumers think that prices are unfair, they can leave the company or spread negative information to other consumers. Price has a major influence on purchasing decisions that occur between sellers and buyers. Al-Salamin's research (2016) shows that most respondents consider price as an important factor that influences their purchasing decisions. This research is similar to that conducted by Muliajaya (2019) which shows that there is a partially significant effect of price on the price of purchasing decisions. The same research was conducted by Chadafi (2016) which showed that price had a positive effect on purchasing decisions. Based on the discussion above, our first hypothesis is:

H1: Price has a positive effect on purchasing decisions of Instagram social media users

2.3.2 Influence of promotion on purchasing decisions of Instagram social media users

The role of promotion for the development of new products in the company is one of the most vital factors for the success of marketing a goods and services product (Brata., 2017). Promotion is part of a marketing strategy, where the promotion has a function to provide information, persuade, and remind consumers both directly and indirectly about a product being sold (Kotler and Keller, 2012). Research conducted by Panjaitan (2019) shows that promotion has a significant effect on consumer purchasing decisions for Bright Gas products. The results of this study are similar to those conducted by Fredik (2018), Njoto (2018), and Lininati (2018), showing that promotion has a positive effect on purchasing decisions. Based on the discussion above, our second hypothesis is:

H2: Promotion has a positive effect on purchasing decisions of Instagram users

2.3.3 Influence of security on purchasing decisions of Instagram social media users

Security can control and maintain data provided by a consumer (Kim and Park, 2013). Furthermore, security includes an online store's ability to control and maintain security over data transactions (Raman and Viswanatahan, 2011). Based on several studies, Anandita (2015) shows that there is a significant influence of security guarantees on purchasing decisions through social networking sites for students in Surakarta. A similar study by Fadhila (2017) shows that security has a significant positive effect on customer purchasing decisions in Indonesia. Khanna (2019) shows that in general six factors influence online purchasing decisions: convenience, security and privacy, product-related factors, service-related factors, website-related factors, and personal factors. Based on the discussion above, our third hypothesis is:

H3: Security has a positive effect on purchasing decisions of Instagram social media users

2.3.4 Influence of Instagram social media users on purchasing decisions

Social media is an online media, where users can easily participate, share, and create content including blogs, social networks, wikis, forums and virtual worlds (Kurniawan, 2017). Social media can also be interpreted as a medium on the internet that allows users to represent themselves and interact, collaborate, share, and communicate with other users and form virtual social bonds. The number of Instagram users in Indonesia in January 2020 was 63 million people with 50.8% female Instagram users and 49.2% male Instagram users (Wearesocial, 2020). One of the reasons people, especially women, shop through Instagram, is because they follow trends that are displayed in the Instagram feed and stories column (Fauziah, 2018). Research on the use of Instagram social media has been conducted by

Lininati (2018) and shows that there is a positive and significant relationship between Instagram social media users and purchasing decisions at the food court. Furthermore, similar research conducted by Puspitarini (2019) showed that Instagram social media users had a positive effect on purchasing decisions. Based on the discussion above, our fourth hypothesis is:

H4: Instagram social media users have a positive effect on purchasing decisions

3. METHOD

3.1 Research Design and Operational Variables

The type of research used here is descriptive research. According to Sekaran (2017:111), descriptive studies aim to help researchers to understand the characteristics of groups in certain situations (for example, explanations of certain market segments), think systematically about aspects in certain situations (for example, factors related to purchasing decisions), provide ideas for further investigation or research, and help make informed decisions. In this study the the dependent variable used is the purchase decision, the independent variables are promotion, price, trust and security and the intervening variable is social media Instagram. The operationalization of variables in this study explains how to measure variables so that they can be operated, by explaining the dimensions, indicators, or variable measurement items in a table (Mercubuana 2020:20).

3.2 Data Collection, Sampling, and Analysis Techniques

Data was collected through a Google form questionnaire with the conversion of statements into scores based on the Likert Scale as listed in Table 1. Based on the table, the scale used in the questionnaire ,is 1-5 which represents the answers of each respondent. This was tested for its effect on purchase decision.

The population is a generalization area consisting of objects/subjects that have certain qualities and characteristics determined by researchers to be studied and then drawn conclusions (Sugiyono 2018:80). The population in this study are all consumers who have shopped online at the marketplace via Instagram at least once. For the sample itself, 200 questionnaires were distributed via a Google form, of which 102 were returned. The sampling method is the non-probability sampling method with purposive sampling technique, namely the technique of determining the sample with certain considerations and criteria (Sugiyono 2018:85).

The data analysis uses SmartPLS 3.0 to test the outer model and the inner model, which tests the validity, reliability, r square, q square, GoF, and hypothesis testing.

Table 1 Likert scale.

Answer Options	Score
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5

3.3 Description of Respondents and Variabel

The majority of respondents were women (62 people, 60.8%). This means that consumers who are active users of Instagram social media are dominated by women. The majority of respondents were 30-34 years old (69 people, 67.6%). This means that the marketplace consumers who shop through Instagram are primarily millennials. In terms of education, most respondents had undergraduate (S1) backgrounds (83 people, 81.4%). This is because it is related to the millennial age who already understand the operation of internet technology. Most respondents had an income between 4,000,000 and 4,900,000 Indonesian Rupiah (65 people, 63.7%). The respondents were primarily employed as private employees (84 people, 82.4%). Respondents in this study have a frequency of opening or using Instagram social media every day (98 people, 96.1%).

3.4 Variable Description

The research aims to examine the factors that influence the purchasing decisions of Instagram social media users on the marketplace, with Instagram as the mediating/intervening variable. After the distribution of 102 respondents, the following are the results of descriptive statistics from the research variables.

3.4.1 Price Variable Distribution Results

The results of the distribution price variable show that the statement "Before buying, I compare product prices on the marketplace with product prices on Instagram" has the highest average value (4.520), which means that the average consumer considers product price information on Instagram before deciding to buy.

3.4.2 Promotion Variable Distribution Results

The results of the distribution promotion variable show that the statement "I know that the marketplace often holds promotions on Instagram" has the highest average value of (4.578). This shows that average consumer knows about the promotion of the marketplace on Instagram.

3.4.3 Trust Variable Distribution Results

The results of the distribution of the trust variable show that the statement "I feel that product information from Instagram provides the information needed by its users" has the highest average value of 4.480. This shows that the average consumer believes that Instagram displays marketplace products needed by its users.

3.4.4 Security Variable Distribution Results

The results of the distribution of the security variable show that the statement "In my opinion, the product information displayed on Instagram is correct." has the highest average value, 4.520. This shows that the average consumer feels safe with the official marketplace product information displayed on Instagram. This is reinforced by the official link included by Marketplace on Instagram.

3.4.5 Instagram Variable Distribution Results

The results of the distribution of the Instagram user variable show that the statement "I am considering buying a product based on comments/reviews from Instagram users." has the highest average value of 4.637. This shows that the average consumer decides to buy products on the marketplace after they see comments/reviews on Instagram.

3.4.6 Distribution Results of Purchase Decision Variables

The results of the distribution of the purchasing decision variables show that the statement "I will recommend others to look for product information on Instagram before buying on the marketplace" has the highest average value of 4.520, which shows that the average consumer will recommend others to seek product information on Instagram before deciding to buy products on Marketplace.

4. DATA ANALYSIS SmartPLS 3.0

4.1 Evaluation of the Measurement Model (Outer Model)

The evaluation of the outer model is done by testing the validity and reliability of the measurements of the research model design.

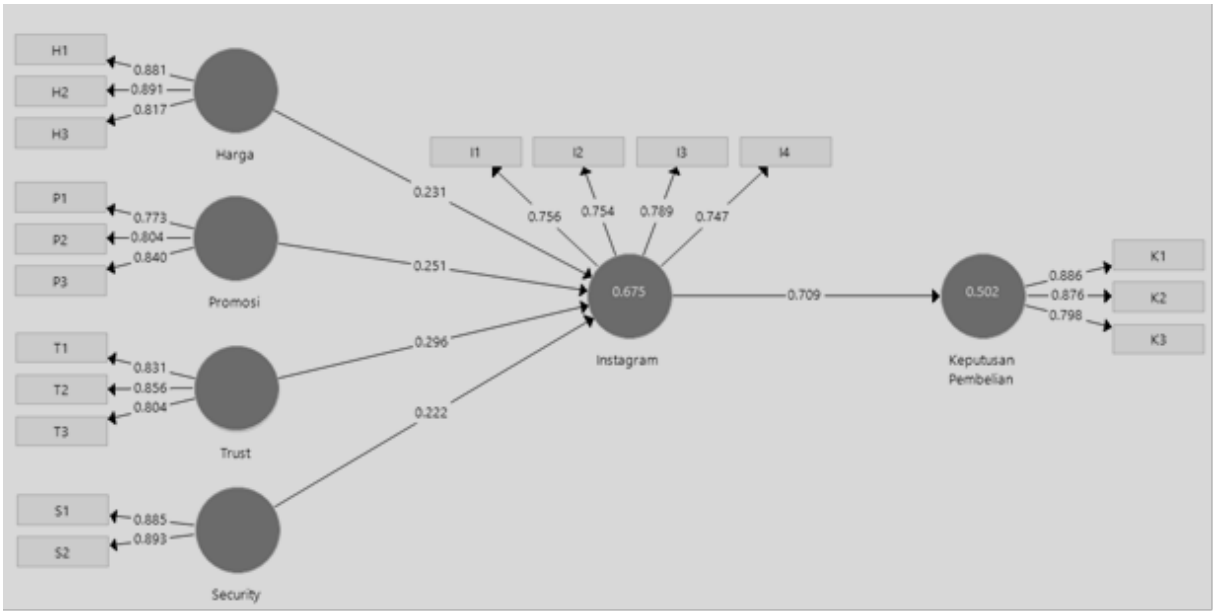

Figure 2 Analysis of the Outer Model Source: PLS 3.0 processing results.

4.1.1 Validity test

The validity test on the indicator is a benchmark that describes the relationship between the reflective indicator score and its latent variable. The validity test consists of convergent validity and discriminant validity.

Convergent Validity: Convergent validity is the correlation between the indicator score and its construct score and can be declared valid if the outer loading value > 0.7 and the AVE value > 0.5 (Ghozali & Latan, 2015). Figure 2 shows the results of the data processing algorithm with PLS.

All indicators have values or correlations between constructs and variables that meet convergent validity because the outer loading value is > 0.70. This means that the results obtained meet the validity criteria.

After the outer loading value, we can see the convergent validity test from the AVE value (Ghozali & Latan, 2015), which is > 0.5. From the data all variables have a value > 0.5 so it can be concluded that all indicators are valid and suitable for use in this study.

Discriminant Validity: In the discriminant validity test, the values in the Fornell-Laker criterion and cross-loading tables are used. The Fornell-lacker criterion value shows the correlation value between the variables themselves and other variables. The value of cross-loading shows an indicator, which is said to meet discriminant validity if the correlation value between indicators on the variable is greater than that of other variables (Ghozali & Latan, 2015). Fornell-lacker criterion and cross-loading values can be seen in Table 2. According to the data, we can see that all the correlation values of a variable are greater than the correlation values of these variables to other variables so that all variables can be declared valid.

Table 2 Fornell-lacker criterion scores. Source: PLS 3.0 processing results.

	Price	**Instagram User's**	**Purchase Decision**	**Promotion**	**Security**	**Trust**
Price	0.864					
Instagram Users	0.676	0.762				
Purchase Decision	0.616	0.709	0.854			
Promotion	0.581	0.673	0.522	0.806		
Security	0.500	0.645	0.606	0.580	0.889	
Trust	0.638	0.700	0.672	0.540	0.549	0.831

Table 3 Cross Loading Value. Source: PLS 3. Processing results.

	Price	**Instagram User's**	**Purchase Decision**	**Promotion**	**Security**	**Trust**
H1	0.881	0.638	0.559	0.538	0.504	0.604
H2	0.891	0.589	0.580	0.510	0.476	0.589
H3	0.817	0.515	0.448	0.452	0.294	0.446
I1	0.428	0.756	0.494	0.527	0.483	0.472
I2	0.626	0.754	0.599	0.536	0.475	0.583
I3	0.510	0.789	0.548	0.443	0.462	0.509
I4	0.478	0.747	0.509	0.541	0.544	0.559
K1	0.495	0.656	0.886	0.494	0.617	0.565
K2	0.554	0.607	0.876	0.440	0.518	0.634
K3	0.538	0.547	0.798	0.400	0.402	0.523
P1	0.462	0.514	0.415	0.773	0.494	0.358
P2	0.422	0.556	0.434	0.804	0.482	0.418
P3	0.521	0.557	0.415	0.840	0.428	0.524
S1	0.447	0.563	0.559	0.423	0.885	0.492
S2	0.442	0.584	0.519	0.605	0.893	0.485
T1	0.488	0.543	0.495	0.455	0.451	0.831
T2	0.568	0.629	0.644	0.442	0.501	0.856
T3	0.529	0.568	0.525	0.450	0.413	0.804

Table 4 Value of Composite Reliability and Cronbach's Alpha.

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Price	0.830	0.840	0.898	0.746
Instagram User's	0.759	0.760	0.847	0.580
Purchase Decision	0.814	0.823	0.890	0.730
Promotion	0.730	0.732	0.848	0.650
Security	**0.735**	**0.736**	**0.883**	**0.791**
Trust	**0.775**	**0.780**	**0.870**	**0.690**

According to the data in Table 3, we can find out if all the correlation values between indicators on the variables are higher than other variables. Therefore, it can be said that each variable has good discriminant validity.

4.1.1 Reliability Test

A reliability test is a method of testing the reliability value of indicators on a variable seen from two values, namely composite reliability and Cronbach's alpha. A variable is declared reliable if it has a composite reliability value and Cronbach's alpha > 0.7 (Ghozali & Latan, 2015). Table 4 shows the value of composite reliability and Cronbach's alpha for each variable. According to the data in Table 4, we can find out if the composite reliability and Cronbach's alpha values for all variables > 0.7 have met the requirements and it can be said that the measurements in the study are reliable.

4.2 Evaluation of the Structural Model (Inner Model)

4.2.1 R-squared (R^2) value

The value of R-squared (R^2) on the structural model is a measure of how much influence certain independent latent variables have on the dependent latent variable. Based on Table 5, the R-squared value of the Instagram variable is 0.675. It can be concluded that the effect of price, promotion, trust and security variables on Instagram is 67.5%. The R-squared value of the purchase decision variable is 0.502, so it can be concluded that the influence of the Instagram variable on the purchase decision is 50.2%.

4.2.2 Value of Q^2 Predictive Relevance

In addition to looking at the magnitude of R-square, the evaluation of the PLS model can also be done by looking at Q^2 to represent the synthesis of cross-validation and fitting functions with predictions from observed variables and estimates of construct parameters. Q^2 measures how well the observed values generated by the model and also the parameter estimates. The value of $Q^2 > 0$ indicates that the model has predictive relevance, while $Q^2 < 0$ indicates that the model lacks predictive relevance (Ghozali and Latan, 2015).

Based on Table 6, it can be seen that the Q^2 predictive relevance for Instagram's endogenous latent variable is 0.355 and purchase decision is 0.357. The value of Q^2 predictive relevance of the endogenous latent variable is > 0, so it can be concluded that the model already has predictive relevance.

Table 5 Value of R-squared (R2). Source: the result of processing smart PLS 3.0

	R Square	R Square Adjusted
Instagram Users	0.675	0.662
Purchase Decision	0.502	0.497

4.2.3 Quality Index

PLS path modeling can identify global optimization criteria to determine the goodness of fit with the GoF index. The GoF index developed by Tenenhaus et al. (2004) is used to evaluate measurement models and structural

models. In addition, the GoF index also provides a simple measurement for the overall prediction of the model. The criteria for GoF values are 0.10 (GoF small), 0.25 (GoF medium), 0.36 (GoF large) (Ghozali and Latan, 2015).

$$GoF = \sqrt{\overline{Communality} \times \overline{R^2}}$$
$$= \sqrt{0.367 \times 0.589}$$
$$GoF = 0{,}465$$

The GoF value is 0.465, which means it can be concluded that the research model is good and also includes a large GoF.

Table 6 Value of Q-squared (Q2). Source: Processing Results Smart PLS 3.0.

	SSO	SSE	Q^2 (=1-SSE/SSO)
Price	306.000	306.000	
Instagram Users	408.000	263.245	0.355
Purchase Decision	306.000	196.744	0.357
Promotion	306.000	306.000	
Security	204.000	204.000	
Trust	306.000	306.000	

4.2.4 Hypothesis Test

Hypothesis testing in this study aims to determine the significance of the effect of exogenous variables on endogenous variables. The test is carried out using a bootstrapping process on smartPLS 3.0. The basis for decision-making the influence between variables is considered significant at the level of 5% if the statistical t value compared to the t table value is 1.96. The test results with bootstrapping from the PLS analysis are:

Test Hypothesis 1 (Influence of price on Instagram Users)

Based on the test results in Table 4, we can see that the correlation of the price variable with Instagram has a path coefficient value of 0.231 and a t value of 2.633. This value indicates that the value of the t statistic is greater than t table (> 1.96). This means that the price variable has a significant effect on Instagram with the first hypothesis, namely price has a positive and significant effect on Instagram.

Then hypothesis 1 is accepted.

Test Hypothesis 2 (Effect of promotion on Instagram Users)

Based on the test results in Table 4, we can see that the correlation of the promotion variable with Instagram has a path coefficient value of 0.251 and a t value of 2.580. This value indicates that the value of the t statistic is greater than t table (> 1.96). This means that the promotion variable has a significant effect on Instagram with the third hypothesis that promotion has a positive and significant effect on Instagram.

Then hypothesis 2 is accepted.

Test Hypothesis 3 (Effect of trust on Instagram Users)

Based on the test results in Table 4, we can see that the correlation of the trust variable with Instagram has a path coefficient value of 0.296 and a t value of 3.330. This value indicates that the value of the t statistic is greater than t table (> 1.96). This means that the trust variable has a significant influence on Instagram with the fifth hypothesis, namely trust has a positive and significant effect on Instagram.

Then hypothesis 3 is accepted.

Test Hypothesis 4 (Effect of security on Instagram Users)

Based on the test results in Table 4, we can see that the correlation between the security variable and Instagram has a path coefficient value of 0.222 and a t value of 2.675. This value indicates that the value of the t statistic is greater than t table (> 1.96). This means that the security variable has a significant effect on Instagram with the fourth hypothesis, namely security has a positive and significant effect on Instagram.

Then hypothesis 4 is accepted.

Test Hypothesis 5 (Influence of Instagram Users on purchase decision)

Based on the test results in Table 4, we can see that the correlation of the Instagram variable with purchase decision has a path coefficient value of 0.709 and a t value of 10.321. This value indicates that the value of the t statistic is greater than t table (> 1.96). This means that the Instagram variable has a significant effect on purchase decisions with the second hypothesis, namely, Instagram has a positive and significant effect on purchase decisions.

Then hypothesis 5 is accepted.

4.3 Indirect Effect

Based on the results of the Bootstrapping calculation in the Specific Indirect Effects Research above, the following can be generated:

- Price has a positive and significant effect on purchase decisions through Instagram because the t statistic's value is 2.750 which is greater than t table = 1.96 and also the p value is 0.006 which is smaller than 0.05.
- Promotion has a positive and significant effect on purchase decisions through Instagram because the t statistic's value is 2.536 which is greater than t table = 1.96 and also the p value is 0.012 which is smaller than 0.05.
- Security has a positive and significant effect on purchase decisions through Instagram because the t statistic's value is 2.486 which is greater than t table = 1.96 and also the p value is 0.013 which is smaller than 0.05.
- Trust has a positive and significant effect on purchase decisions through Instagram because the t statistic's value is 3.027 which is greater than t table = 1.96 and also the p value is 0.003 which is smaller than 0.05.

5. DISCUSSION

Based on the results of the above data processing against the proposed hypothesis, it can be seen that all the hypotheses that have been set by the researchers are accepted. The following is an analysis related to the influence between variables according to the proposed hypothesis:

5.1 The influence of price on purchase decisions through Instagram users

After testing the hypothesis, it is known that price has a positive and significant effect on purchasing decisions through Instagram because the t statistic's value is 2.750 which is greater than t table = 1.96 and also the p value is 0.006 which is smaller than 0.05. This is relevant to the results of the IDN Times survey in the 2019 Indonesia Millennial Report which stated that 60% of consumers chose price as the main factor in considering the products they would buy online.

5.2 The influence of promotions on purchase decisions through Instagram users

After testing the hypothesis, it is known that promotion has a positive and significant effect on purchase decisions through Instagram because the t statistic value is 2.536 which is greater than t table = 1.96 and also the p-value is 0.012 which is smaller than 0.05. This is relevant to research by Njoto (2018: 612-618), which found that promotions, namely advertising, sales promotion, and personal selling have a significant effect on consumer purchasing decisions.

5.3 The influence of between security on purchase decisions through Instagram users

After testing the hypothesis, it is known that security has a positive and significant effect on purchase decisions through Instagram because the t statistic's value is 2.486 which is greater than t table = 1.96 and also the p value is 0.013 which is smaller than 0.05. This is relevant to research by Anandita (2015, 203-210), Fadhila (2017, 60-64) and Khanna (2019, 1-9) which show that security has a positive effect on purchasing decisions of Instagram social media users.

5.4 The influence of trust on purchase decisions through Instagram users

After testing the hypothesis, it is known that trust has a positive and significant effect on purchase decisions through Instagram because the t statistic's value is 3.027 which is greater than t table = 1.96 and also the p value is 0.003 which is smaller than 0.05. This is relevant to Chadafi (2016, 1-8), Zatalini (2017, 145-146) and Nawangsari (2018, 61-67) showing that trust has a positive effect on purchasing decisions.

5.5 The influence of Instagram social media on purchase decisions users

After testing the hypothesis, it is known that the correlation of the Instagram variable with purchase decision has a path coefficient value of 0.709 and a t value of 10.321. This value indicates that the value of t statistic is greater than t table (> 1.96). This means that the Instagram variable has a significant effect on purchase decisions, which means that Instagram has a positive and significant effect

on purchase decisions. This is relevant to the research of Lininati (2018, 97-102), Miranda (2017, 1-15) and Puspitarini (2019, 71-80) which show that Instagram social media has a positive effect on purchasing decisions.

6. CONCLUSION AND SUGGESTIONS

6.1 Conclusion

The research aims to analyze the purchasing decision factors of Instagram social media users in the marketplace. The analysis test uses Smart PLS 3.0 to analyze the correlation between these variables. By the analysis of the results and discussion in the previous chapter, the following conclusions can be drawn:

- Based on the results of the first analysis, price has a positive and significant effect on Instagram. This means that price is the main factor in considering buying products on the marketplace through Instagram.
- Based on the results of the second analysis, promotion has a positive and significant effect on Instagram. This means that the promotion of products on the marketplace is consistent and routine on Instagram, making Instagram users consider buying products on the marketplace through Instagram.
- Based on the results of the third analysis, it shows that the security variable has a positive and significant effect on Instagram. This means that security by providing valid information is one of the things that consumers consider when buying products on the marketplace through Instagram.
- Based on the results of the fourth analysis, it shows that the trust variable has a positive and significant effect on Instagram. This means that the trust / confidence of a consumer in considering buying a product in the marketplace is very high.
- Based on the results of the fifth hypothesis test, it shows that the Instagram variable has a positive and significant effect on purchasing decisions. This is supported by the variety of features provided by Instagram to make it easier for consumers to find and compare the products they want to buy.
- The results of the tests carried out state that the promotion, price, trust, security and Instagram variables have a positive and significant effect on purchase decisions on the marketplace.

6.2 Suggestions

Based on the results of the study and also the conclusions, the following are suggestions that researchers can give to managerial and further researchers. Advice for academics: from the results of the R-square test, it can be seen that the effect of price, promotion, trust and security variables on Instagram is 67.5%. While the influence of the Instagram variable on the purchase decision is 50.2%. It can be expected that future research can expand the model by examining other aspects that also influence purchasing decisions using Instagram on the marketplace. Further research is also expected to re-examine purchasing decisions in the field of Marketplace and social media with a larger number of samples, and with various other social media. Suggestions for Instagram users / consumers: as consideration and input for Instagram social media users in buying products on the marketplace through information from Instagram, this can be used as material to compare products through social media before deciding to buy on the marketplace.

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High technologies intelligence management model at national level organizations

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ABSTRACT The purpose of this study is to investigate the interrelation of the main variables affecting technology intelligence management to design an appropriate model of high technologies intelligence management at national level organisations. Based on a literature review, a conceptual model was developed. It includes 11 main variables classified into three levels: the operational, managerial, and environmental levels. Participants in the present research included 160 experts in technology intelligence from Iranian universities and industry, 137 of whom completed the research questionnaire. Research information and hypotheses were analysed and tested using structural equation modeling, SPSS, and LISREL software. The findings show that to properly manage a technology intelligence system in high technologies at national level organisations, attention to the managerial and operational levels is more important than environmental factors. It also shows that to establish technology intelligence in organisations, managers should pay more attention to these factors to gain confidence in the effectiveness of the implementation of this system.

KEYWORDS High technologies, innovation management, technology intelligence, technology intelligence management, technology intelligence processes

1. INTRODUCTION

Due to the continuous increase of competition limits caused by globalisation and flourishing, dynamic markets, technology intelligence has become an important factor in strategic and business intelligence (Schuh et al. 2015). Therefore, technology forecasting and technology intelligence at the corporate level are becoming increasingly important to create a positive impact that complements interventions at the political level (Farrukh & Holgado 2020). The growth of competition in the business environment makes technology-based organisations more dependent on the constant flow of information from the organisation's environment. In order to gather information from all available information sources, ranging from the internet to multivariate and heterogeneous data from the company's internal databases and information, organisations need intelligent systems (Wu et al. 2018).

In technology-intensive sectors, technology intelligence activities should be aimed at collecting and providing relevant and timely information on technological information relevant to new or emerging technologies (Kerr & Phaal 2018). However, the gathered information is usually saved in organisational repositories and distributed database systems, but is not efficiently used.

Proper provision and use of the collected information requires systematic and innovative solutions that monitor technological changes, and in accordance with these changes, help the organisation's management to make intelligent decisions. Predicting trends and

changes in technology development is an important quality necessary for survival and growth in today's competitive environment. One of the systematic solutions to monitor changes is to design and implement technology intelligence in an organisation. Organisations should pay special attention to the concept of technology intelligence and its applications, considering the technology-oriented nature and also the turbulent atmosphere of the competitive environment of today (Hataminejad et al. 2017).

Technology intelligence refers to an activity that supports decision-making at many levels (Loh & Mortara 2017). In other words, technology intelligence, with an impact on activities like strategic planning, use of resources, technology change management, absorption capacity, research and development, learning, construction and production, product and process development, marketing, and dynamic capabilities (identified as technological innovation capabilities), plays a key role in supporting decisions (Teza et al. 2016). Therefore, it can be said that supporting technological decisions has become possible through technology intelligence.

Research has been conducted in different industries to establish technological intelligence structures and processes in advanced countries and at transnational levels (Lichtenthaler 2003, 2004a & 2004b; Wu 2018; Thavorn 2020). However, despite the importance of technology intelligence systems in technological decision-making, a comprehensive model of technology intelligence in technology-oriented organisations has not yet been introduced. Therefore, the present study provides an opportunity to design and evaluate a model to create robust technology intelligence systems for technology decision-makers in the field of high technology at national level organisations.

The purpose of the present study is the conceptual design of an appropriate technology intelligence management model and the investigation of how to properly combine the main dimensions of technology intelligence (including technology intelligence processes management, technology intelligence missions and goals, technology intelligence coordination structures, technology intelligence tools and infrastructure of the organisation, and technology intelligence cycles) in the field of high technologies at national level organisations.

2. THEORETICAL FOUNDATIONS AND LITERATURE REVIEW

2.1 Technology intelligence definitions

From the perspective of different researchers, and in chronological order, different definitions of technological intelligence are examined and the definition employed in this research is presented thereafter.

Ashton (1997) identifies technology intelligence as sensitive business information about foreign or technological threats, opportunities, or scientific developments that have the potential to influence a company's competitive position. According to another definition, technological intelligence is a part of competitive intelligence that supports decision-making about scientific and strategic investments and helps decision-makers to calculate and evaluate the relative strategic ability of other organisations (Hohhoff 1997). According to Coburn (1999), technology intelligence is an analytical process that transforms competing distributed technology data into usable and relevant technological knowledge about competitors' positions, the extent of effort, and trends.

Lichtenthaler (2003) defines technology intelligence as one of the main tasks of technology management, which is independent of the implementation method. According to Lichtenthaler, the purpose of technology intelligence is to take advantage of the potential opportunities and to defend the organisation against potential threats by providing information related to technological trends in a competitive environment. In the study conducted by Taghva and Majidfar (2014), technology intelligence is defined as a group of activities related to supporting the decision-making concerning the general and strategic management of an organisation.

According to Nasullaev and Manzini (2020), technology intelligence is a strategic development process combined with creativity to improve performance by identifying potential options and new strategies, and reducing the likelihood of failure in the event of strategic discontinuities. Gonçalves and de Almeida (2019) consider technology intelligence to be one of the various methods of using competitive intelligence. According to these researchers, technology intelligence, like competitive intelligence, strives to find and process weak signals in order to identify opportunities and threats and provide practical

information. In the study by Thavorn et al. (2020), technology intelligence is defined as a tool for predicting trends and adjusting the needs of future communities with knowledge and technology provision.

In the definitions provided by different researchers, two key concepts are common to most of them. The first is the use of technology intelligence as a decision-making support activity, and the second is its use in an organisation's strategic decision-making. The definition of technological intelligence considered standard in this research is the one provided by Savioz (2004). Savioz defines technology intelligence as decision-making support activities in general and technology management with recourse to providing timely information related to the facts and technological trends of the organisation's environment through collection, analysis, and dissemination.

Technology intelligence equips an organisation with the ability to store and present information to foster an awareness of the threats and opportunities of technology (Kerr et al. 2006). Moreover, technology intelligence offers mechanisms for benefiting from business and technology opportunities and getting prepared to confront threats through the effective presentation of information related to the organisation (Lichtenthaler 2003). Technology intelligence can guide research and development and offer the possibility for the timely utilisation of emerging technologies. The results gained from the implementation of technology intelligence can upgrade innovative and sustainable routes, increase competitiveness and bring social benefits (Thavorn et al. 2020). In addition, technology intelligence serves as an effective way of adopting a strategy to develop production and technology (Naruse & Kosaka 2011). Intelligence, in an important field like technology, can also improve the conditions of organisations in terms of technological innovation capabilities and competitiveness (Bonyadi Naeini et al. 2016).

2.2 Technology intelligence cycles

The effectiveness of technology management depends primarily on the quality of the technology intelligence process, i.e., the acquisition and evaluation of information about technological trends. Various cycles for technology intelligent processes have been presented, and here we follow the three cycles presented by Herring, Kerr, and Savioz.

The Herring Cycle (1997) consists of 5 steps: planning and direction, collection and reporting, processing and storage, analysis, and dissemination. In the first step, the key information needs of decision-makers, including strategic needs, early warnings, and key players, are identified. In the second step, the data is collected from a wide variety of sources using various techniques and tools. In this regard, the internet serves as a significant source for gathering the information needed for intelligence. The third step involves modifying and storing information using methods such as detection, language translation, data reduction, and text analysis in such a way that it is available to analysts. After preparing the information resources during the previous steps, in the fourth step the information is analyzed based on a systematic approach and in accordance with the information needs and the set goals of intelligence. Finally, in the fifth step, information and communication are disseminated by adopting a structured method.

The Kerr cycle (2006) consists of six phases: coordination, searching, filtering, analysis, documentation, and dissemination. The first phase of this model coordinates the technology intelligence efforts needed to fill specific technology know-how gaps after receiving input (needs or requests) from intelligence applicants. After the search phase and in the filter phase, the information is checked for relevance and, in case of irrelevance, is returned to the search phase. In the analysis phase, the information is interpreted, the report on its relevance is submitted to the specific context of the organisation, and intelligence requests are made. After completing the analysis, documentation is done. This includes creating the necessary reports, structuring the content of intelligence information, storing information, and managing knowledge within the organisational memory. Finally, the last phase is completed to inform intelligence customers of the new and updated intelligence.

Savioz's (2004) technology intelligence model is presented with a focus on knowledge creation. The main or direct activities of creating value in Savioz's model are characterised as being the same technology intelligence processes (i.e., formulation of needs and collection, analysis, distribution, and use of relevant information). Value manifests itself in the improvements made in decision-making, meaning that when the quality of information (in terms of content and

timing) improves, uncertainty decreases (Savioz 2004). Indirect or supporting factors empower key activities (technology intelligence cycle). In a technology intelligence system, these supporting factors include general processes of technology intelligence management, technology intelligence goals and missions, technology intelligence structures, and technology intelligence tools.

2.3 Technology intelligence in practice

Technology intelligence goals and missions determine the goal and output of a technology intelligence system. The mission of technology intelligence must always be related to the mission and strategy of the business (Talaoui & Kohtamäki 2020). Lack of knowledge or incongruity in senior executives' and researchers' perceptions of the mission and goals of technology intelligence can lead to the failure of intelligence activities. Therefore, intelligence activities should always be founded on intelligence mission and goals, which are themselves related to the business mission and strategy.

Technology intelligence structures describe how intelligence activities are delegated to different units and individuals, and how they are organised. There are three general structures for coordinating technology intelligence activities: formal, project-oriented, and informal. In the formal structure, affairs are coordinated through a hierarchy of positions and divisions (Lichtenthler 2000, 2003 & 2004b). The project-oriented structure is used to coordinate intelligence activities in temporary projects (Abbass & Mehmood 2020). Finally, in the informal structure, intra-organisational communication intensifies freely. This structure is highly dependent on organisational culture and intra-organisational communication channels. The informal structure of technology intelligence seeks to direct spontaneous behaviours to collect information.

Technology intelligence tools can be classified into two categories: technology intelligence methods and technical infrastructure. The application of each method depends on various criteria, including strategy, environmental complexity and industry uncertainty, time, and complexity of the method itself. The most important methods of technology intelligence are process extrapolation, proprietary analysis, bibliographics, scenario building, cross-impact analysis, orientation, Delphi, relational trees (Lichtenthaler 2000), patent analysis (An et al. 2018), technology opportunity discovery (Yoon et al. 2015) and technology life cycle analysis (Greitemann et al. 2017). Another technology intelligence tool is the technical infrastructure which is crucial to the successful implementation of competitive information systems and facilitates the systematic collection and distribution of intelligence information. This tool is used in most stages of the intelligence process (collection, analysis, and distribution).

2.4 Managerial aspects of technology intelligence

Technology intelligence is one of the central processes in technology management because it examines and evaluates innovative trends. Four management factors, namely strategic management, knowledge management, innovation management, and technology management, form the basis of technology intelligence. Strategic management is the art and science of the formulation, implementation, and evaluation of multiple-task decisions that enable an organisation to achieve its strategic goals. According to Wheelen et al. (2018), strategic management is a set of managerial decisions and actions that determine the long-term performance of a company. In this research, strategic management includes four stages of environmental review: strategy formulation, implementation, control, and evaluation. The first stage, the environmental review, includes examining the external environment. This includes, for example, industry, the national environment, the transnational environment, and examining the internal environment of the organisation, which includes the structure, culture, and resources of the organisation. In the strategy formulation stage, the mission of the organisation is first formulated, and after determining the operational goals and aspirations, strategies are formulated. The last step in determining the strategies is to determine the policies of the organisation,since policies are the link between development and implementation. In the implementation phase, the organisation determines the plans, budgets, and procedures, and finally, it controls and evaluates these strategies.

Knowledge management is the systematic process of discovering, selecting, organising, summarising, and presenting information in a

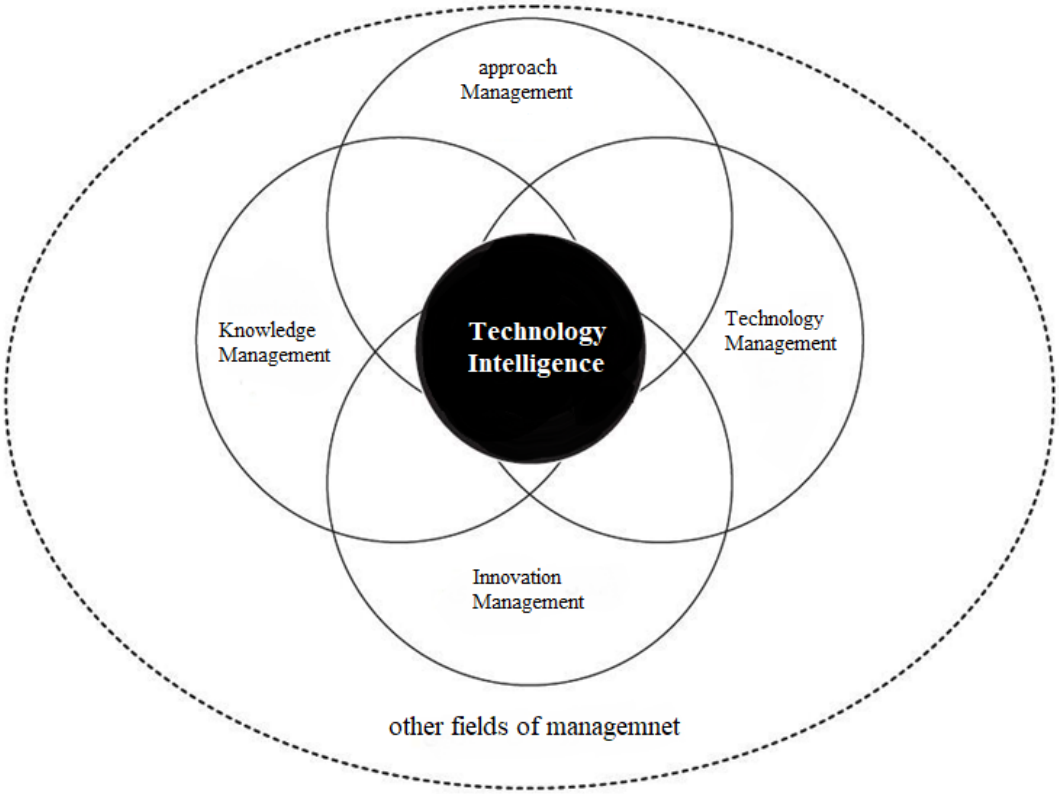

Figure 1 The position of technology intelligence among other areas of management (Savioz 2004).

way that improves people's knowledge in their area of interest. Knowledge management helps the organisation to gain knowledge and insight from its experiences and focus its activities on acquiring, storing, and using knowledge so that it can use this knowledge in problem-solving, dynamic training, strategic planning, and decision-making. Knowledge management not only prevents the deterioration of the organisation's intellectual assets, but also continuously adds to these assets. Knowledge management can also include all the methods through which an organisation manages its knowledge assets, including how to collect, store, transfer, apply, update, and create knowledge (Lubitz & Wickramasinghe 2007).

Innovation management contributes to the organisations' competitiveness, economic performance, and environmental sustainability (Chen et al. 2019). The research literature shows different perspectives on the circumstances and stages of the innovation process. What these views have in common is that at the beginning of the process, there is something similar to the idea, and at the end, a kind of realisation or commercialisation of the idea occurs. Technology intelligence is used in the early stages of this process because it can create an idea or act as an entryway to inspire it (Savioz 2004).

Technology intelligence processes are the basic actions for managing a system that designs, directs, and develops it. Design, here, means creating a theoretical model that represents what needs to be created in reality, and is a process that is predominately creative (Ulrich & Probst 1988). Directing is an online process that constantly guides the technology intelligence system to accomplish its goals and mission. Finally, system development involves conscious changes to cope with social and strategic changes. Figure 1 shows the position of technology intelligence among the aforementioned management factors.

2.5 Environmental factors affecting technological intelligence

Internal factors, external factors, and human resources are the three constructs that can be placed among the environmental conditions affecting technological intelligence. The reason for labeling these factors "environmental" is that they include internal and external environment factors of the organisation. These factors have a significant impact on technology intelligence management, as described below.

Nosella et al. (2008), in their research, point to four factors: an organisation's business model, type of industry, culture, and resources dedicated to research and development. In the study conducted by Peyrot et al. (2002), the

amount of an organisation's capital, the cost of the technology intelligence system from the perspective of managers, the ease of the use of the technology intelligence system from the perspective of managers and employees, and the applicability and necessity of the technology intelligence system from the perspective of managers and employees, are considered to be internal organisational factors. Tao and Prescott (2000) examined the size of the intelligence unit (the number of people working in the technology intelligence unit). Lichtenthaler (2004) also considers the innovation-based organisational culture as an internal organisational factor. In addition to these factors, two other factors, the organisation's emphasis on technological leadership and the marketing of existing goods and services, were added according to research experts.

External organisational factors were also extracted from previous research and are as follows: use of open innovations in organisations (Veugelers et al. 2010), formation of social networks within the organisations in order to support technology intelligence activities, and formation of social networks outside the organisations, e.g. specialist networks (Mortara 2009), paying attention to the results of technology foresight at national level, and paying attention to specific policies in various fields of science and technology at the national level on the part of organisation managers (Calof & Smith 2010). Government support for creating technology intelligence processes in the organisations was also added, following expert consultation.

Researchers have identified different roles for individuals in a technology intelligence system (Savioz 2004). Individuals can initiate various activities, including gathering, analysis, evaluation, and spread of information in the organisation (Safdari Ranjbar et al. 2017). Such roles require different skills. Typically, in large companies, each role is fulfilled by one or more individuals. However, it is difficult to find individuals who have all the necessary skills. Various studies have been conducted on the importance of human resources and the actors in the technology intelligence system. Various topics, including observers, users, and mediators of technology intelligence, technology ambassadors, listening posts, external experts, and technology intelligence specialists, have been studied.

Table1 Examples of technology intelligence implementation in Iran and in the world.

Implementation Example	Author(s) and Year of Publication	Derived Benefit or the Result
Fuel cell technology	Karshenas & Malaek 2013	Designing a technology-intelligent system at the national level and identifying functions affecting its sustainability
Fifty-five companies active in the pharmaceutical industry	Bonyadi Naieni et al. 2016	Increasing technological innovation capabilities and competitiveness
Pharmaceutical companies present at the Iran Pharma exhibition	Amini 2017	Upgrading competitive advantage
Companies operating in Pardis technology park	Samadi et al. 2018	Increasing the level of strategic innovation
Research institute of Petroleum industry	Khodayari et al. 2020	Monitoring technology changes
Mapna Tose'e 1Power Plant Construction and Development Company	Khamse et al. 2019	Reinforcing technology intelligence in power plant industries and other companies of the Mapna Group
United States Patent and Trademark Office Database	Yoon et al. 2015	Building a performance-based knowledge base for technology intelligence, including information about products and technologies and the relationship between them
Oil Turbo Compressor Company	Ranjbar & Cho 2016	Implementing technology intelligence in designing and building a gas turbine production system
Cambridge University Technology Management Center	Loh & Mortara 2017	Designing a performance measurement framework for technology intelligence that helps structure future measurements and evaluate strategies
Petrochemical industry	Gonçalves & de Almeida 2019	Increasing organisations' willingness to carry out complex projects with outsourcing because there was no need for deep work

Table 2 The relationships among research variables proposed by this research (abbreviated as proposed) and other sources in the scientific literature. H = Hypothesis. Op. = operational; Man. = Managerial; Env. = Environmental.

Source of scientific literature	Dependent Variable	Independent Variable	H	Level
Lang 1998; Kerr 2018; Majidfar 2013	Technology intelligence cycles	Mission and goals of technology intelligence	H1	**Op.**
Lichtenthaler 2007; Majidfar 2013	Technology intelligence cycles	Coordination structures of technology intelligence activities	H2	
Savioz 2004	Technology intelligence cycles	Technology intelligence infrastructure and tools	H3	
Proposed	Technology Intelligence infrastructure and tools	Mission and goals of technology intelligence	H4	
Savioz 2004	Coordination structures of technology intelligence activities	Mission and goals of technology intelligence	H5	
McDonald & Richardson 1997	Mission and goals of technology intelligence	Technology intelligence process management	H6	**Man.**
Savioz 2004	Technology intelligence infrastructure and tools	Technology intelligence process management	H7	
Lichtenthaler 2007	Coordination structures of technology intelligence activities	Technology intelligence process management	H8	
Savioz 2004	Technology intelligence process management	Knowledge management of the organisation	H9	
Proposed	Mission and goals of technology intelligence	Knowledge management of the organisation	H10	
Yoon 2015	Technology intelligence cycles	Knowledge management of the organisation	H11	
Proposed	Technology intelligence process management	Strategic management of the organisation	H12	
Jennings & Lumpkin 1992	Mission and goals of technology intelligence	Strategic management of the organisation	H13	
Proposed	Technology intelligence cycles	Strategic management of the organisation	H14	
Savioz 2004	Technology intelligence process management	Innovation management of the organisation	H15	
Proposed	Mission and goals of technology intelligence	Innovation Management of the organisation	H16	
Proposed	Technology intelligence cycles	Innovation Management of the organisation	H17	
Lichtenthaler 2004a, 2004b	Technology intelligence process management	Intra-organisational factors	H18	**Env.**
Veugelers et al. 2010	Technology intelligence process management	Extra-organisational factors	H19	
Tao 2000; Majidfar 2013	Technology intelligence process management	Technology intelligence human resources	H20	
Proposed	Mission and goals of technology intelligence	Intra-organisational factors	H21	
Proposed	Mission and goals of technology intelligence	Extra-organisational factors	H22	
Krystek,1993; Majidfar 2013	Mission and goals of technology intelligence	Technology intelligence human resources	H23	
Lichtenthaler 2004	Technology intelligence cycles	Intra-organisational factors	H24	
Veugelers et al. 2010	Technology intelligence cycles	Extra-organisational factors	H25	
Lichtenthaler 2000	Technology Intelligence Cycles	Technology intelligence human resources	H26	

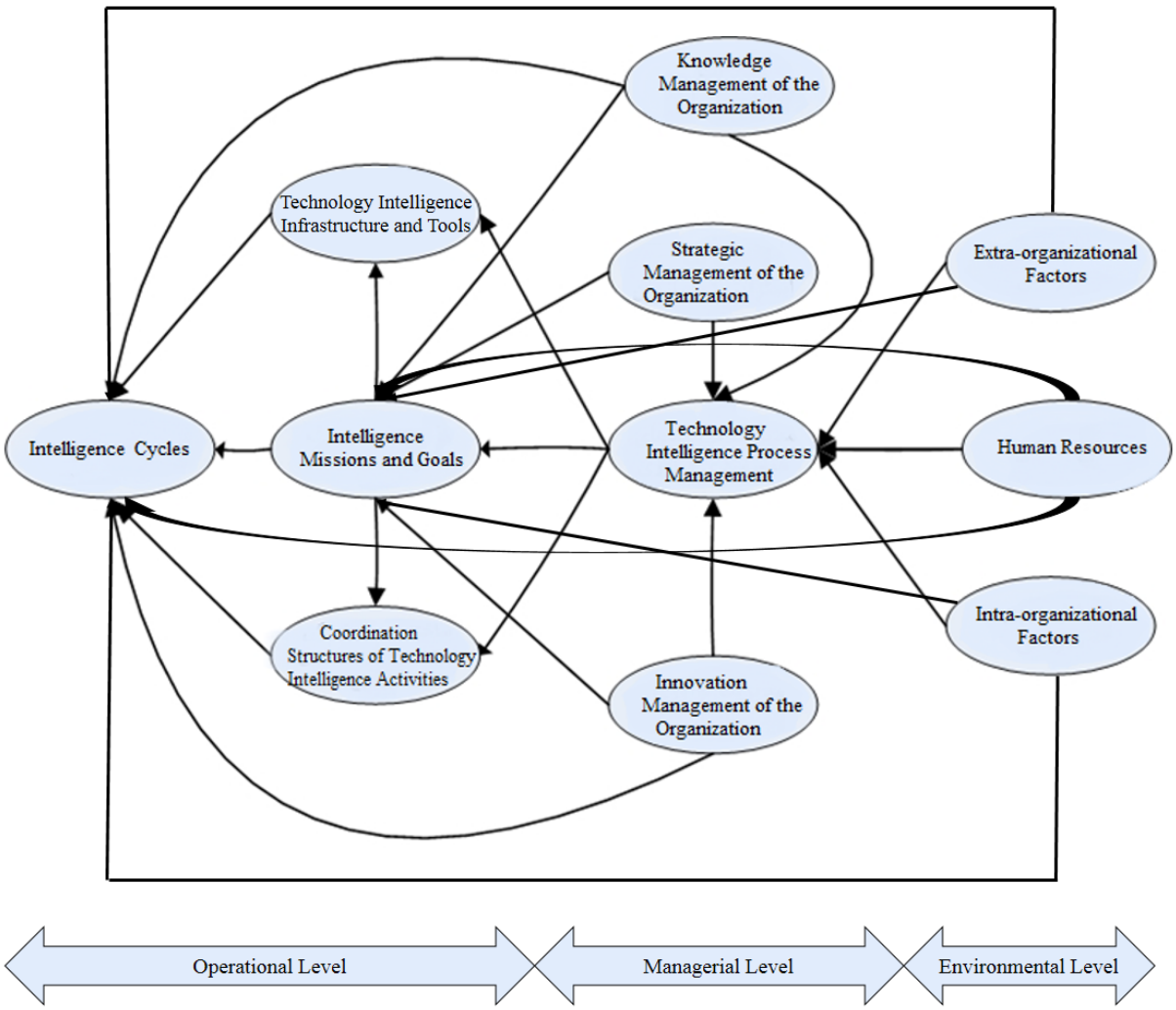

Figure 2 Conceptual model of the research.

2.6 Research literature

Over the past few years, several businesses have been established in Iran and throughout the world that provide technology intelligence services. For an organisation or industry to be able to use technology intelligence, certain conditions are required: 1) the organisation operates within the environment of dynamic technological industries, a place where the rate of change is high, and the possibility for the latest technologies to get introduced is strong; 2) the organisation owns highly technological products, in a place where technology is a distinctive factor, introduction rate is high, and timing to enter the market is of importance; 3) a large portion of the organisation's activities are dedicated to research and development; and 4) the organisation expects a great deal of its business revenue growth to come from new products (Karshenas & Malaek 2013).

In general, it can be said that the implementation of technology intelligence often increases the level of innovation and competitiveness of businesses and industries. However, many of these businesses failed to sell their services and gain profit from them (Sadraie 2009). Establishing a technology intelligence system can vary depending on the technological needs and trends of each country. Therefore, a comprehensive study of these environmental conditions and technological trends can play a central role in preventing the failure of these businesses. Table 1 shows some examples of technology intelligence implementation at national and international levels.

2.7 Hypotheses and conceptual framework

According to previous studies, in order to properly manage technology intelligence systems in the field of high technologies at national level organisations in the desired situation, the main variables of technology intelligence can be classified into three levels

or layers. These are the operational level (including four dependent variables: technology intelligence tools and infrastructure, structures coordinating technology intelligence activities, mission and goals of intelligence, and finally, technology intelligence cycles), the managerial level (including three independent variables: strategic management of the organisation, knowledge management of the organisation, and innovation management of the organisation, and a dependent variable: technology intelligence system management), and the environmental level (including three dependent variables: extra-organisational factors, intra-organisational factors, and human resources). Table 2 shows the relationships among these variables proposed in this study and by other sources in the scientific literature, and Figure 2 shows the proposed conceptual model with respect to the relationships among these variables.

3. METHODOLOGY

The present study presents applied research in terms of its purpose and cross-sectional research in terms of time. The approach in this study is the use of a quantitative method along with the data collected through a questionnaire, in the form of survey research. The statistical population of this study included 160 Iranian experts, to whom questionnaires were sent electronically. Of these, 137 responses were received. Given this, it can be said that the study had an acceptable response rate.

Following the use of the structural equation modeling (SEM) method to analyze the results, the appropriate sample size can be obtained based on the number of relationships between variables in the model. To validate the structural equation analysis for each relation in the model, between five and ten samples must be collected (Hooman 2009; Qasemi 2009). In this study, there were 20 relationships between variables in the model, meaning that at least 100 questionnaires were needed.

The questionnaire contained 74 questions. For each question, a five-point Likert scale was used, the answer options of which were as follows: very high frequency, high frequency, moderate frequency, low frequency, and very low frequency. When the purpose is exploring the attitudes of the participants in research, a Likert scale functions well (Nardi 2003; Rea & Parker 2005). The questionnaire included 11 sets of questions categorised based on the intended components of the research. A summary of the demographic information of the participants in this study is available in Table 3.

The data obtained from the questionnaire were analyzed using inferential statistics and through structural equation modeling (analysis of covariance structure) and with the help of SPSS and LISREL software. Structural equation modeling is a very general and powerful multivariate analysis technique in the multivariate regression family that can test a set of regression equations simultaneously. This method is a comprehensive approach that uses confirmatory factor analysis and econometric models to analyze the hypothetical relationships between latent variables (invisible or theoretical) measured by explicit variables (observable or experimental). Structural equation modeling is sometimes called structural analysis, causal modeling, and sometimes LISREL (Hooman 2009).

Table3 Frequency and percentage of the study participant demographics and general information.

Demographic or General Information	Group	Frequency	Frequency (Percentage)
Education	Ph.D.	24	17.5
	Ph.D. Candidate	22	16.1
	Master's Degree	78	56.9
	Bachelor's Degree	13	9.5
Position	Top-level manager	4	4.4
	Middle-level manager	16	11.7
	Researcher or Faculty member	43	31.4
	Expert or Consultant	72	52.6
Organisation Type	Industries and companies	36	26.3
	Research and academic centers	45	32.8
	Mediating and supporting organisations or institutions	56	40.9

Table4 Factor loading and reliability coefficients of the research variables.

Construct	Questions	Cronbach's Alpha	Result
Technology intelligence process management	1-9	0.754	Acceptable
Technology intelligence tools and infrastructure of the organisation	10-12	0.709	Acceptable
Intra-organisational factors related to technology intelligence	13-24	0.695	Relatively acceptable
Coordination structures of technology intelligence activities	25-27	0.721	Acceptable
Technology intelligence human resources	28-33	0.745	Acceptable
Technology intelligence mission and goals	34-37	0.727	Acceptable
Strategic management of the organisation	38-48	0826	Acceptable
Environmental factors of the organisation	49-54	0.684	Relatively acceptable
Technology intelligence cycles	55-60	0.794	Acceptable
Knowledge management of the organisation	61-67	0.797	Acceptable
Innovation management of the organisation	68-74	0.779	Acceptable

The constructs explored in this study, including technology intelligence cycles, technology intelligence tools and infrastructure of the organisation, technology intelligence coordination structures of activities, technology intelligence mission and goals, technology intelligence process management, knowledge management of the organisation, innovation management of the organisation strategic management of the organisation, human resources, intra-organisational factors, and extra-organisational factors, were analyzed in separate measurement models. To validate each of these measurement models, questions with a factor loading of less than 0.5 had to be eliminated. However, none of the research questions had such conditions. Therefore, all questions remained for analysis.

3.1 Reliability assessment

When Likert scale questions are employed in questionnaires, Cronbach's alpha is suitable to determine reliability (Gay et al. 2009; Trochim & Donnelly 2008). Therefore, the reliability of the variables in this study was assessed using Cronbach's alpha. As shown in Table 4, the calculated Cronbach's alphas for all constructs, except the two constructs: internal factors and environmental factors of the organisation, were higher than 0.7. This indicates a high reliability of the research tool. These two constructs also have a relatively acceptable reliability because they are close to 0.7. Moreover, Cronbach's alpha calculated for the whole questionnaire is 0.876, which indicates a very high reliability for the research tool.

3.2 Validity assessment

In order to assess the validity of the research, content validity and face validity methods were used. Face validity is a part of content validity (Danaiefard et al. 2004). Content validity refers to the extent to which a construct contains enough relevant information (Ghauri, Gronhaug & Strange 2020). In the present study, two methods were used to prove the validity. The first method referred to expert agreement in the field. In this study, the opinions of university professors and industry experts were used. The second method is to use standard scholarly questionnaires in relevant articles and books. It is also worth mentioning that the entire factor loading of the questions in each construct was more than 0.5, hence approving the convergent validity (Table 2).

4. RESEARCH FINDINGS

After collecting and analyzing the data and considering the distinct effect of the variables in each of the three layers, the structural equation model was used to test the research hypotheses in each layer separately. Hypotheses could be analyzed at the operational level (H1-H5) and managerial level of the model in four categories: i.e., technology intelligence management (H6-H8), technological knowledge management of the organisation (H9-H11), strategic management of the organisation (H12-H14), and innovation

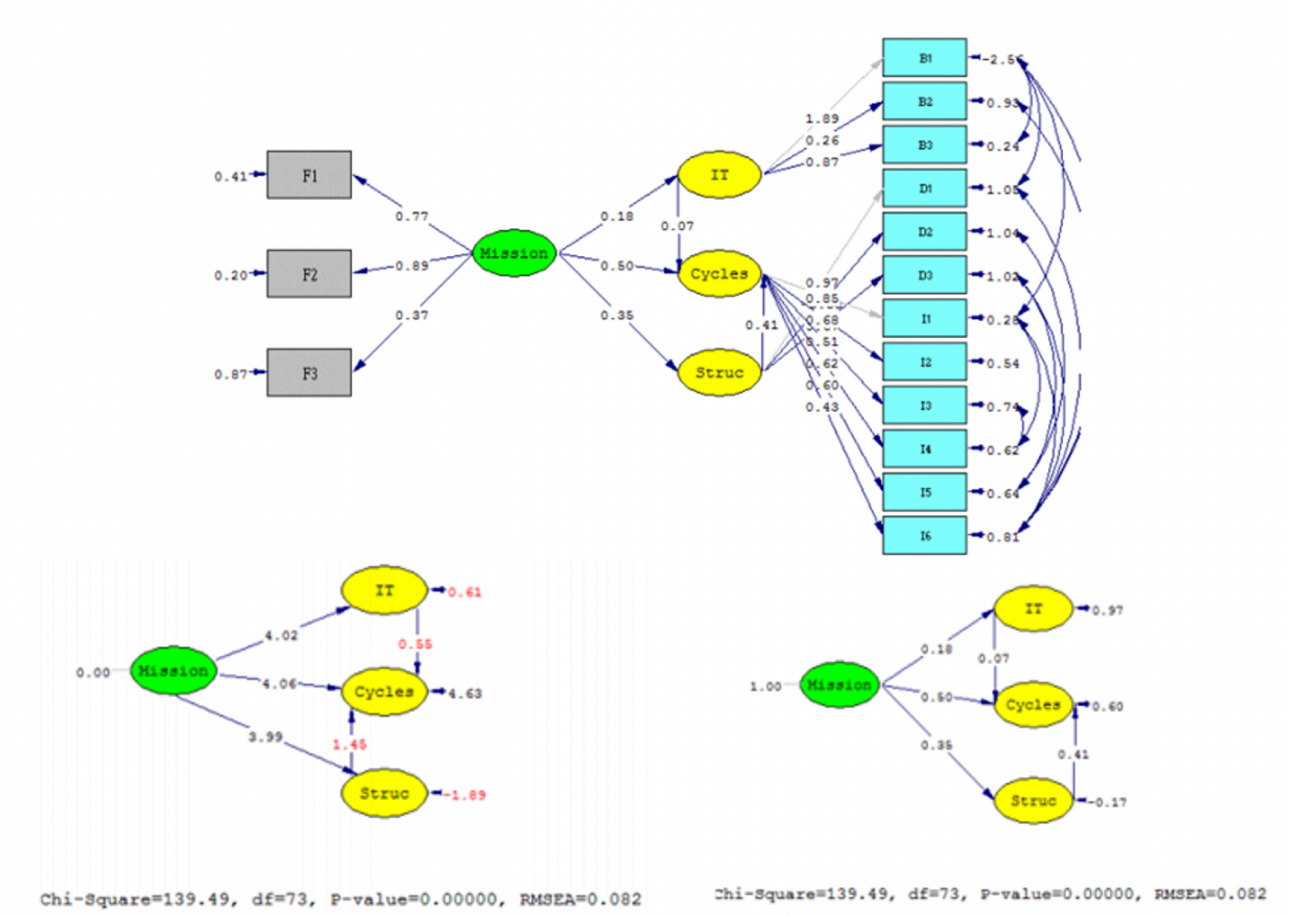

Figure 3 Structural equation model for hypotheses related to the operational level.

management of the organisation (H15-H17), and sub-hypotheses of the environmental level of the model in three categories: i.e., the effects of intra-organisational factors, extra-organisational factors, and human resources on the management of technology intelligence processes (H18- H20), goals and mission of technology intelligence (H21- H23), and technology intelligence cycles of the organisation (H24- H26). The research hypotheses were separately examined at all three levels and the results were presented in standard estimation mode.

The structural equation modeling developed for H1-H5 is observable in standard and meaningful modes in Figure 3. As demonstrated in Figure 3, only the relation of constructs pertaining to H1, H4, and H5 were significant and these hypotheses were confirmed. Moreover, the relationship between constructs related to H2 and H3 was not meaningful. Therefore, these hypotheses were rejected.

After examining the operational level, the hypotheses related to the managerial level were assessed according to the same four categories. As can be seen in Figure 4, in the technology intelligence process management category, the relationship between constructs pertaining to H6, H7, and H8 were significant and these hypotheses were confirmed. Fit indices indicate the proper fit of the model.

As shown in Figure 5, in the category of technology intelligence knowledge management, the relationships among constructs pertaining to hypotheses H9, H10, and H11 were meaningful and these hypotheses were confirmed based on the initial structural equation model.

As shown in Figure 6, in the technology intelligence strategic management category, only the relationship of constructs pertaining to H12 and H13 was meaningful and these hypotheses were confirmed based on the initial conceptual model. The relationship between constructs related to hypothesis H14 was not meaningful. Therefore, this hypothesis was rejected.

According to Figure 7, in the technological innovation management category, only the relationships of constructs pertaining to hypotheses H15 and H17 were meaningful and these hypotheses were confirmed based on the initial structural equation model. Moreover, the relationships between the constructs

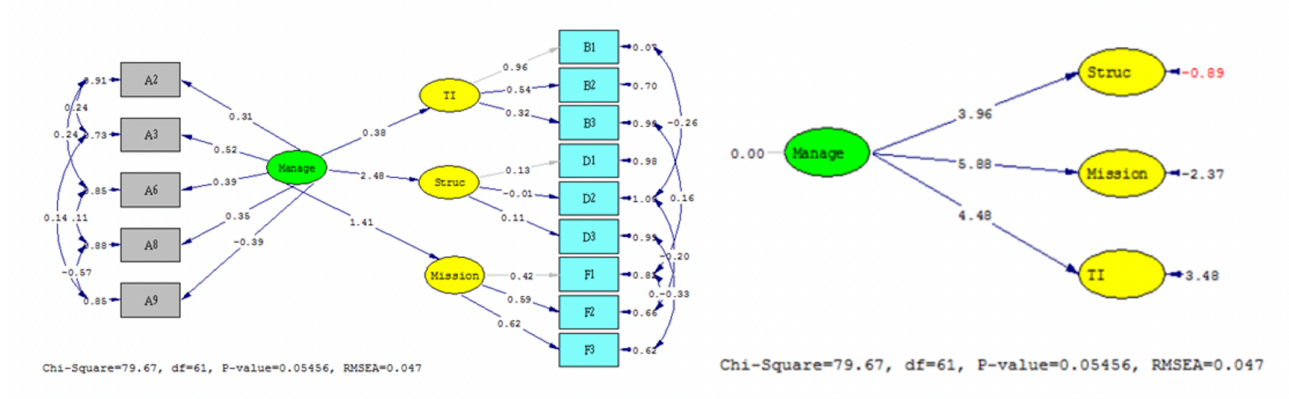

Figure 4 Structural equation model for hypotheses related to the category of technology intelligence process management.

related to H16 weren't significant and, as a result, this hypothesis was rejected.

Finally, the hypotheses related to the environmental level (including the three structures of intra-organisational, extra-organisational, and human resources) and their impacts on the three categories of technology intelligence processes management, technology intelligence mission and goals, and technology intelligence cycles were examined. As demonstrated in Figure 8, based on the initial structural equation model, H18, H19, and H20 (of technology intelligence processes management) were rejected.

As shown in Figure 9, based on the initial structural equation model and in meaningful mode, H21 and H22 were rejected, but H23 was confirmed.

Similarly, it can be observed in Figure 10 that, based on the initial structural equation model and in meaningful mode, H24 and H26 were rejected, but H25 was confirmed. In addition, a summary of research findings related to the research hypotheses is given in Table 5.

According to the results in Table 5, the study's hypotheses were statistically significant and all but 11 hypotheses were confirmed. Following this, the fitness of the research model was evaluated. The purpose of evaluating the fitness of the model was to determine whether or not the theoretical relationships between the variables, considered by the researchers when formulating the theoretical framework, were confirmed by the data gathered from the research. In other words, this test determines the degree to which the model conformed to the empirical data.

In the estimation process in the LISREL software, a matrix called "implicit covariance matrix" (an estimated covariance matrix of the statistical population) is obtained. The model has a better fit, to the extent that this matrix gets closer to the covariance matrix of the sample population. Values obtained from the set of fit indices revealed that the research model had a good and appropriate fit, and the results of the fit indices indicated the fit of the conceptual research model. Consequently, there was no need to adjust the adequacy of the model fit.

Finally, according to the rejected and confirmed hypotheses based on a survey carried out on experts, the final model was developed, as presented in Figure 11.

The values of t in Table 5 show that all the conceptual components of the corrected final model are significant. The values of λ also show the importance of each relationship in the model, which can be used as a guide for future applied research or in practice.

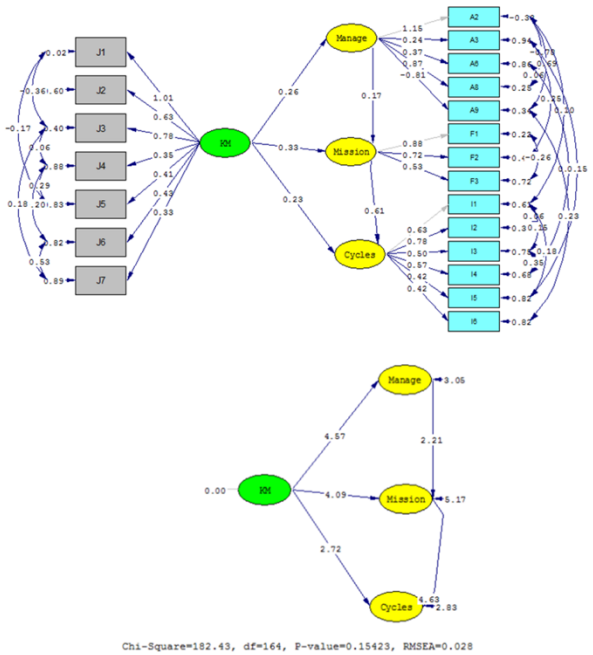

Figure 5 Structural equation modeling for hypotheses related to the technological knowledge management of the organisation category.

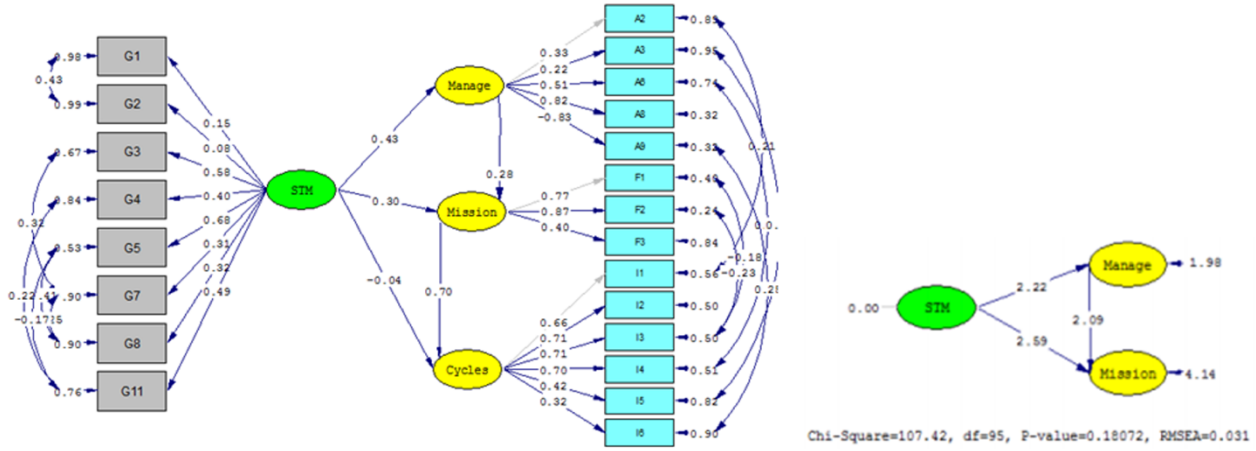

Figure 6 Structural equation modeling for hypotheses related to the organisational strategic management category.

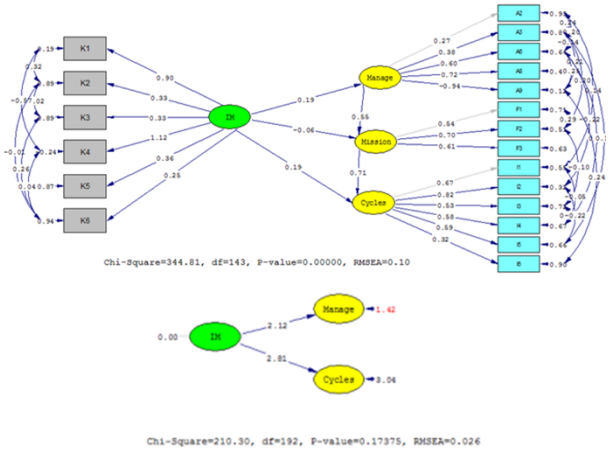

Figure 7 Structural equation modeling for hypotheses related to the organisational innovation management category.

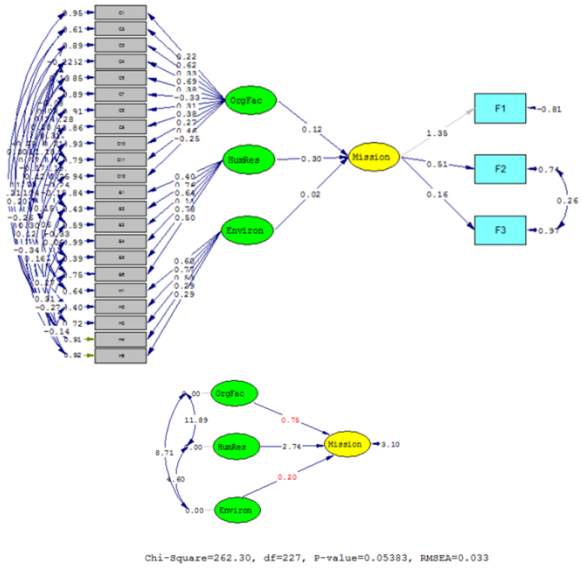

Figure 9 Structural equation modeling for hypotheses related to the impact of the environmental level of the conceptual model on technology intelligence goals and missions.

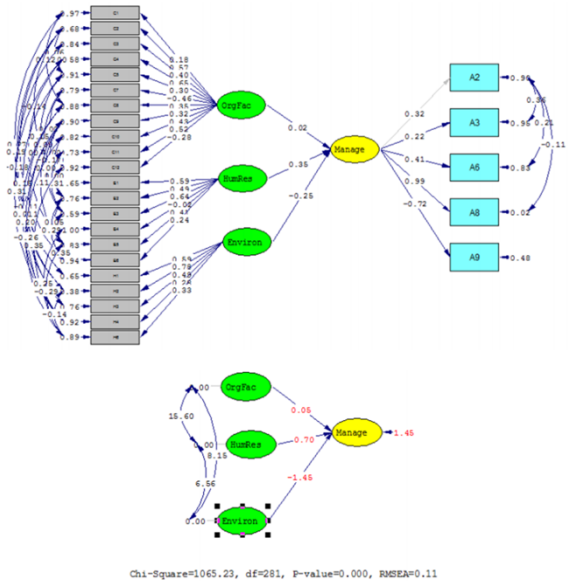

Figure 8 Structural equation modeling for hypotheses related to the impact of the environmental level of the conceptual model on technology intelligent process management.

5. DISCUSSION AND CONCLUSION

In this research, based on the theoretical structure of the primary constructs, the measurement model was the reflective type and the primary constructs defined the indices. As a result, structural equation modeling was used to analyze the general model and the research hypotheses. In the factor analysis of the model, a confirmatory factor analysis was first used to evaluate the construct validity of the research tools and the fit of the measurement model. The confirmatory factor analysis indicated that the proposed factor models are suitable according to the measurement model in standard estimation mode and significance mode, as well as fit indices.

Structural equation modeling was then used to measure the relationships between the

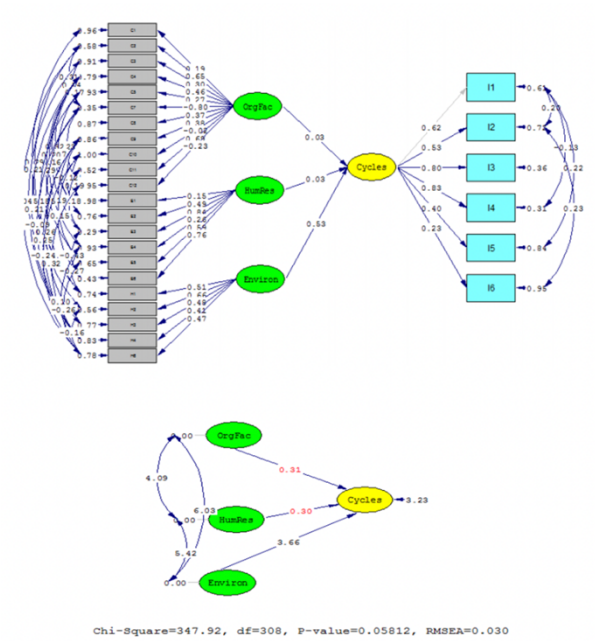

Figure 10 Structural equation modeling for hypotheses related to the impact of the environmental level of the conceptual model on cycles.

hidden variables. In this model, based on the data, the relationships between the components of the conceptual model were investigated by calculating the path coefficients and the values of factor loading in three layers in the form of research hypotheses. To investigate the research hypotheses, eight structural equation models were formed and the impacts of the variables on each other were analyzed. Accordingly, the relationships between some of the research variables were not confirmed and fifteen hypotheses out of the twenty-six hypotheses were confirmed.

According to the results obtained from research hypotheses testing, it appeared that the mission and goals of technology intelligence have a positive effect on technology intelligence cycles, technology intelligence infrastructure of the organisation, technology intelligence tools, and coordination structures of technology intelligence activities.

Table 5 Factor loading and t-statistics.

Level	Hypotheses	Factor loading	T-statistics	Status
Operational	H1	0.67	6.99	confirmed
	H2	-	-	rejected
	H3	-	-	rejected
	H4	0.22	4.24	confirmed
	H5	0.33	3.78	confirmed
Managerial	H6	1.41	5.88	confirmed
	H7	0.38	4.48	confirmed
	H8	2.48	3.96	confirmed
	H9	0.26	4.57	confirmed
	H10	0.33	4.09	confirmed
	H11	0.23	2.72	confirmed
	H12	0.38	2.22	confirmed
	H13	0.30	2.69	confirmed
	H14	-	-	rejected
	H15	0.31	2.12	confirmed
	H16	-	-	rejected
	H17	0.31	2.01	confirmed
Environmental	H18	-	-	rejected
	H19	-	-	rejected
	H20	-	-	rejected
	H21	-	-	rejected
	H22	-	-	rejected
	H23	0.30	2.74	confirmed
	H24	-	-	rejected
	H25	0.53	3.66	confirmed
	H26	-	-	rejected

Therefore, the first, fourth, and fifth hypotheses of the study were confirmed. In this regard, it can be claimed that technology intelligence missions and goals play a central role at the operational level. The deeper the insight into the goals and missions of technology intelligence reveals itself in the members of organisations, especially managers, the faster and more effective cycles of technology intelligence, and effective design

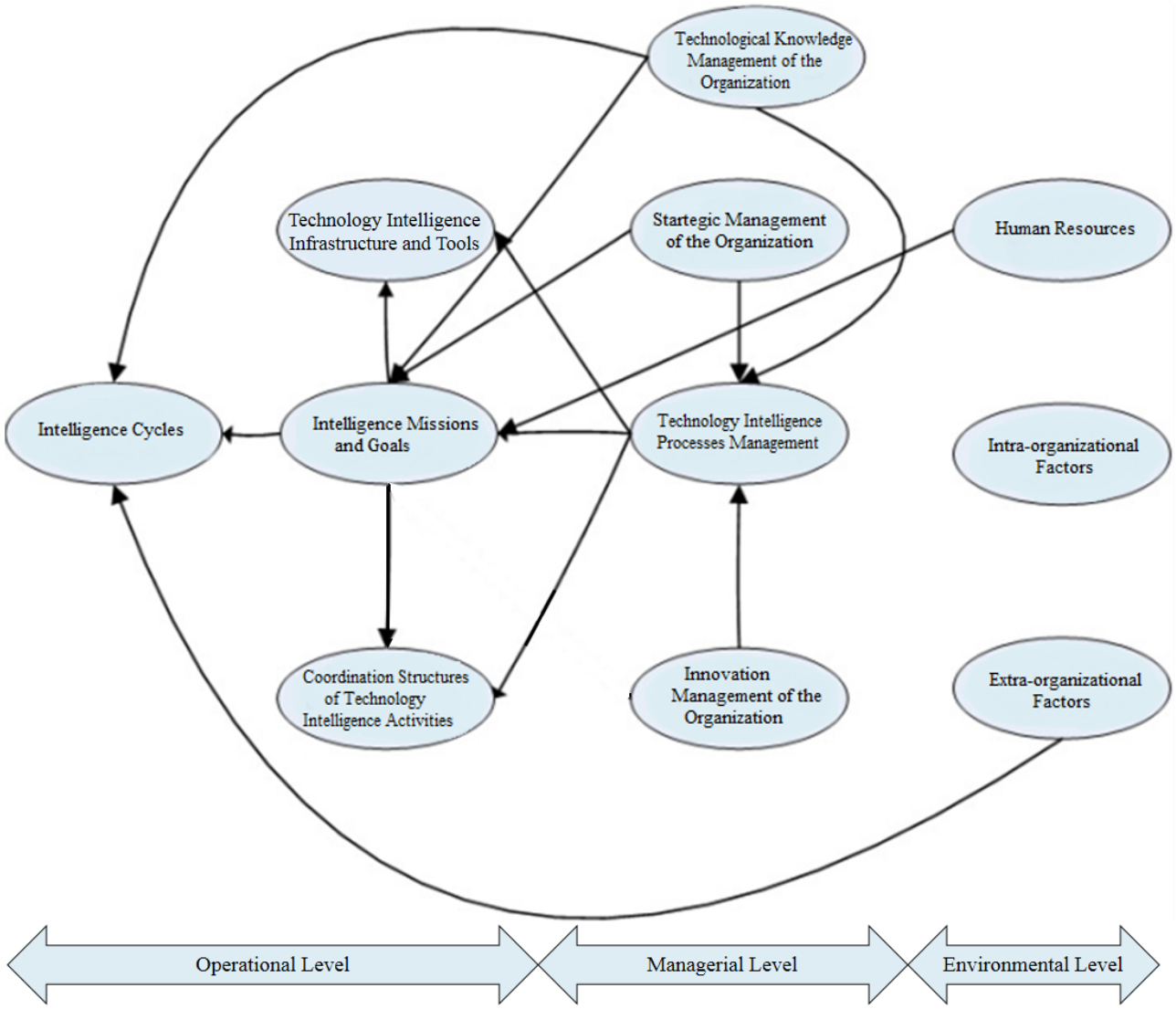

Figure 11 The appropriate model of intelligence management of high technologies in organisations at a national level (based on the confirmed hypotheses).

and selection of the type of technology intelligence coordination structure, would be. This insight can also facilitate the provision of appropriate technology intelligence infrastructure and technology intelligence tools for organisations.

In addition, the results showed that the strategic management of the organisation does not have a direct impact on technology intelligence cycles. This leads to the rejection of the fourteenth hypothesis of the research. Also, innovation management of the organisation does not affect the goals and missions of technology intelligence, so the sixteenth hypothesis was rejected as well. In general, technology intelligence process management and knowledge management, considering the confirmation of all relevant hypotheses, play a more important role than strategic management and innovation management at the managerial level. They have a direct and more significant impact on missions and goals, coordination structures, tools and infrastructure, and the technology intelligence cycle.

At the environmental level, these three factors (intra-organisational, extra-organisational, and human resources) had no impact on the technology intelligence process management. Therefore, the eighteenth, nineteenth and twentieth hypotheses were rejected. Furthermore, except for human resources, these factors did not affect the mission and goals of technology intelligence. Given the positive impact of human resources on the mission and goals of technology intelligence, the acceptance of technology intelligence as a decision-making approach by people in organisations can help to better understand the mission and goals of technology intelligence. This acceptance primarily depends on the culture dominating the

organisation and the support of senior management.

Considering the rejection of the twenty-fifth hypothesis, the only factors influencing the cycles of technology intelligence at the environmental level are the external factors such as the use of open innovations and the formation of social networks. Intra-organisational factors and human resources have little impact on this construct. Therefore, focusing on external factors can facilitate technological intelligence cycles in the organisation.

In summary, the research findings show that most of the confirmed hypotheses are related first to the management level of the model (10 confirmed hypotheses out of 12 hypotheses) and then to the operational level of the model (3 out of 5 hypotheses). The lowest number of confirmed hypotheses is related to the environmental level (2 out of 9 hypotheses).

Although these findings generally support the initial conceptual model, several outcomes were relatively unpredictable. Some results need to be understood by further research. Thus, in general, these results support the conceptual model at operational and managerial levels. This indicates that in the opinion of experts, for proper management of a technology intelligence system in high technologies at national level organisations, it is more important to pay attention to managerial and operational levels. At these levels, three variables have the most impact on the other variables and play a key role in this model: technology intelligence missions and goals, process management, and technological knowledge management of the organisation.

The practical conclusions of this research are the following:

Due to the complexity of the relationships of variables in a technology intelligence system, designing an evolutionary process for the establishment of technology intelligence in organisations that are not officially and perfectly familiar with technology intelligence and its formal processes and structures is recommended.

Operational and managerial levels are the most critical components of a technology intelligence system. Hence, teaching the concepts and methods of technology intelligence by experts to the managers and employees of the organisation who are setting up the technology intelligence system is a necessity.

Since technology intelligence missions and goals, and process management have the most impact on the model, need analysis of the information required by managers and experts in the field of high technologies to plan the future technology intelligence system is critical.

Strengthening the organisation's IT infrastructure, including internal network, internet, hardware, and software requirements of technology intelligence, is also recommended.

The managerial level has the most confirmed hypotheses in the model. Therefore, the integration of knowledge management, innovation management, strategic management systems, and technology intelligence systems of organisations will improve and make this system more efficient.

Additionally, in future research, appropriate models for the specific applications of technology intelligence could be investigated in the form of case studies in other organisations and industries, such as biotechnology or nanotechnology. It is also possible to study the impact of variables like organisational culture and organisational environment on the interactions in technology intelligence activities. Technology intelligence is not limited to large companies; nevertheless, due to financial, technical, skill-related, and time limitations, the majority of small and medium-sized companies are neglected. Consequently, scholars could analyze models for technology intelligence processes in small and medium-sized organisations as well.

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Book review: *We never expected that – a corporative study of failures in national and business intelligence* by Avner Barnea

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We never expected that – a corporative study of failures in national and business intelligence. By Avner Barnea. (Lexington books, Lanham, Maryland, 2021)

For JISIB Barnea has previously written about competitive intelligence in Israel (2016), about Israeli start-ups in cyber security (2018), and about how AI will change intelligence and decision-making (2020).

The book, *We never expected that – A corporative study of failures in national and business intelligence*, is not on Israeli intelligence per se. Still, the best documented of the four cases presented come from the First Intifada in 1993 when Barnea was well situated to observe what was going on behind the scenes. For 27 years, until 1997, he was the Senior Official for Intelligence in the Prime Minister's office. Since then, he has been a competitive intelligence consultant, a teacher and student of intelligence studies and sine 2016 a research fellow at the National Security Studies Center, NSSC.

The book, which is a translation of a book in Hebrew, which again builds on the author's PhD thesis, proposes an analysis of a series of intelligence failures. To study failures is a good way to learn. It is a good methodology, maybe the best. To present a book with both government and state failures is also a good idea from the perspective that there are bound to be fruitful parallels. So far so good.

Unless one speaks Hebrew, it's difficult to access experience gathered from within Israeli intelligence as so little is translated. Israeli intelligence relies very much on an oral tradition of knowledge transfer which makes this task even more difficult. When we learn about how Israeli intelligence works and how the people working there think, the sources are often external, like in the classic book *Dangerous Liaison* by Cockburn and Cockburn (1991).

The aim of the book is to classify events according to the type of risk they represent. This is highly laudable and much needed.

The book starts with a claim: that intelligence methodology has reached a "glass ceiling," meaning an unacknowledged barrier to advancement in the intelligence profession. This could be true as it corresponds to findings in the intelligence literature. Barnea also argues that there have been too few parallels drawn between state and private experience of intelligence failures, which is also a fair claim. A weakness in the book is that it only builds on four cases, two from the private and two from the public sector. The empirical basis may, in other words, be limited.

The outcome of the exercise of the book is the presentation of a new dichotomy, or model, dividing "risks," or better "surprises," into "concentrated" and "diffused". The author claims that this will make a breakthrough in the intelligence field and the reader immediately wonders whether this claim can

be supported by the data presented. The notion of a "concentrated attack" refers to Handel (2003) in the book, but it's actually from an earlier article by Handel published in 1984, described as a "deliberate and concentrated attack". These attacks are planned by one actor carrying out plans (Singer 1958), through concealment and disinformation. The other type of attack is a "diffused attack," defined as "surprise attacks, spontaneous and unplanned". So, they cannot be predicted. So, we have one group of attacks that is planned and one that is unplanned.

It's a weakness that there are not clearer definitions and that the dichotomy presented in the book is not discussed in greater detail compared to other existing theories that divide and try to understand the notion of risk. This goes back at least to what is called Knightian uncertainty, a lack of any quantifiable knowledge about some possible occurrence, as opposed to the presence of quantifiable risk. Knight's risk is something that can be measured. That which cannot be measured is called "uncertainty". So, following the Knightian notion of risk, there would be no case of a diffused risk that cannot be measured.

Barnea's "diffused risk" may remind some of the notion, popularized by Rumsfeld, about "unknown unknowns," or events we simply cannot know because even the idea of the type of risk is unknown to us. The idea is actually not Rumsfeld's but goes back to the psychologist Joseph Luft (1916–2014). In 1955 he created a useful tool for illustrating and improving self-awareness, and mutual understanding between individuals within a group with his colleague Harry Ingham. They called the model the Johari Window model and it is shown in Figure 1.

Barnea's unknown unknowns are of a special type: namely spontaneous and

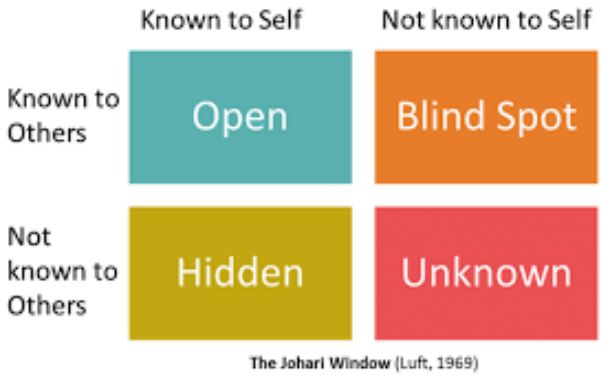

Figure 1 The Johari Window Model.

unplanned. We can also imagine non-spontaneous unknown unknowns and planned unknown unknowns. Unknown unknowns simply mean that others know, but we do not. They are events that are not even on our radar. In many cases they often speak more to our perception of the world and what may happen, and to our cognitive abilities.

Barnea's concentrated attack could be said to be a known unknown, a "deliberate and concentrated attack" planned by one actor through concealment and disinformation. It is what we can know if we had a more capable intelligence organization.

The author uses the First Intifada and the 2008 recession as examples of diffused attacks, meaning they are surprise attacks, spontaneous and unplanned. One could argue that the first Intifada in December 1987 must have had a minimum of planning to be carried through, but the author does a good job at showing the complexity and uncertainty that led to this event, for example that riots broke out instantly without much PLO direction. There was a string of events which led up to it, including the killing of a Jewish person in Gaza followed by the killing of Palestinian workers in a civilian car. But there must have been a minimum of planning among those who came to the street. Anyway, the question becomes one of the degrees of planning.

The second example given by the author is the 2008 recession. This example is less clear. The recession was not deliberately planned of course, but it could have been foreseen as a result of reckless economic policies carried out in the US over decades. Many analysts did foresee it and have received much acclaim as analysts for having done so. Thus, it's more difficult to see this example as a clear case of a "spontaneous" event. There were also many "surprises" in the recession, not the least the timing of the crisis, as is often the case with stock markets. It's practically impossible to say exactly when they will unfold. You know something is brewing but it's difficult to know at what date it will be disrupted. We are very much in a similar situation with the stock markets today, they could fall drastically in 2022. It's more difficult to say in which quarter this may happen.

As examples of concentrated attacks, the author uses the 9/11 attack and the collapse of IBM in 1993. 9/11 was not planned by one actor, but it certainly was a "deliberate and concentrated attack", and it was concealed. It was planned by an organization, al-Qaeda, not

by an individual, even though Khalid Sheikh Mohammed is often cited as the mastermind. Thus, the example is not difficult to accept, but the definition given by the author at the beginning raises questions as to whether the example was well chosen.

The last example presented by the author is IBM. IBM did not collapse in 1993 as it says in the introduction ("1993 collapse of IBM"), but in Chapter 7 this is adjusted to the headline "almost collapse", which is more correct. In the late 1980s and early 1990s, the company faced difficulty after decades of success. However, the difficulties of IBM were not caused by one person or cause, but a series of incidents. It's not clear to what degree this was an intelligence failure. One reason is suggested as: "This was because IBM's core mainframe business had been disrupted by the advent of the personal computer and the client server. IBM couldn't compete with smaller nimbler less diversified competitors." Denning (2011).

CEO Thomas J. Watson Jr. suffered a heart attack and retired in 1971. After that the company had no less than four unsuccessful successors, until Louis "Lou" Gerstner took over in 1993. Gerstner, CEO of IBM from 1993 until 2002, turned the company around mainly by starting to listen to its clients, according to Denning (2011). The intelligence effort this implied, for example starting an official competitive intelligence function and office at IBM, has been noted by many authors, for example Behnke and Slayton (1998) and Prescott and Williams (2003).

At the end of the book the author suggests how methods/activities can be transferred from business intelligence to national intelligence and vice versa. The book consequently uses the term "business intelligence" (BI) as was common some decades ago before BI became all about software and not about "competitive intelligence" or "market intelligence" when appropriate. This can be confusing to some readers.

The author notes that for BI it's about sharing information internally, relying more on open source and measuring the value of information. For national intelligence to BI it's about defining key intelligence topics and using competing hypotheses ("analysis of Competing Hypothesis, ACH), as developed by Richards (Dick) J. Heuer, Jr., of the CIA in the 1970s, building on abductive reasoning. These are probably good conclusions, but I expect that they come from a much larger amount of experience, which the author has not shown through the four cases presented in the book. The book is valuable more because of the collective experience that Barnea brings into the conclusion in Chapter 8 than because of what can be drawn out of the model, or the cases used. What makes Barnea's book especially interesting is how the author brings experience from the state sector to the private sector and vice versa, having worked in both sectors himself.

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