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The effect of the Covid 19 pandemic on the development of the knowledge graph as an integrated recovery accelerator

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Abstract. The spread of the 2019 Corona virus Disease pandemic (Covid-19) resulted in many organizational entities being forced to redesign business processes, reducing the cost of reducing working hours, to terminating employment (layoffs). The informal sector has the worst impact. Thus, both the government and the private sector make various efforts in overcoming problems of social impact that arise. One of them is through the formation of the Task Force for the Acceleration of Handling Covid19 (covid19.go.id) as a single contact crisis center. However, the extent of the impact that arises will result in preventive, curative and promotive efforts at risk of not being handled properly.

The implementation of knowledge management based on graphs (knowledge graph) will enable agile integration between various sources of information. The Graph Data Model captures the relationships of various different entities by connecting them through the edge of information extracted from various heterogeneous sources. After the data is represented in a graphical format, there are various analytic graph techniques for asking multi-hop (multi-node) relationships between entities in the knowledge graph that is built. In addition, graphs allow users to visualize data quickly, interactively and exploratively for analysis.

1. Introduction
Early transmission of the Corona Virus Disease outbreak in Indonesia was first discovered in March 2020. The chain of transmission of the SARS-2 derivative virus that first broke out in Wuhan City, Hubei Province, China was suspected to originate from foreigners passing through Indonesia. Until May 2020, statistically there were 14032 patients with 973 deaths (7%) and 2698 patients recovered (19%). With the diverse demographic and cultural characteristics of Indonesia it is a challenge for various parties to reduce the number of sufferers. But not only that, the impact arising from this pandemic is also a big homework that not only needs to be handled by the government but also the private sector in a sustainable and integrated manner. Here we need the role of a knowledge
management-based information system that not only functions administratively and as a decision-making tool, but also as an aggregator and disseminator.

Current knowledge graphics are everywhere as the backbone of several applications - from search engines, recommender systems, recommendation systems, knowledge management systems to artificial intelligence. Utilization of knowledge charts in health care space as well as social risk mitigation has proven to be an effective method for mapping the relationship between large diversity and the structure of demographic and psychographic data. Graphics provide the extraordinary ability to model latent relationships between information sources and capture linked information for example entity relationships that other data models fail to capture. The main purpose of this article is to describe how the use of knowledge graphs has increased significantly in the current era of the 4.0 industrial revolution, which can affect the possibility of related parties as information users and service providers to be more effective and efficient in finding the information they need between various variables, and available data sources.

2. Literature Review
Knowledge Graph is a network (graph structured knowledge base) where there is a collection of things that want to be known by the user description, and how it can relate between entities and knowledge with each other [1]. A semantic technology use to aggregate information and map relationships between content. Usually used to utilize Natural Language Search and Artificial Intelligence. The background of this Knowledge graph is heterogeneity and variations in various sources of information, both structured and unstructured information. Knowledge graph acts like the structure of the human brain that stores information and facts in a structured but flexible way and has bi-directional relationships [2]. One example of how semantic quality affects search is in the field of skin diseases where the term lay “skin irregularities” in medical terms is “skin lesion” or “skin lesions” (the correct medical term for these symptoms). [3] Users or prospective patients look for it using a web search engine, which is usually preferred over websites and specialized health services. However, the search results that have been displayed to address this particular health need lead to poor retrieval effectiveness, misinformation, and low likelihood of user satisfaction.

![Figure 1](image-url)

Figure 1. Main process that contributes to the Knowledge Graph

If knowledge management is used to capture and reuse knowledge within an entity [4] then the knowledge graph is about how to attract and integrate as many sources of knowledge as possible to answer problems and solve problems. Implement M2M (Machine to Machine), IoT and advanced AI which broadly makes search engines and wearable devices smarter. Understanding and expertise makes it possible to expand the scope of knowledge charts more specifically and intuitively than before. This triggers an organizational entity must refraim consumers’ expectations, with people being retrained to ask what they want. As a result, organizations must be able to answer these types of multidimensional questions with the specificity of search engines. The flow chart of the Knowledge Graph preparation is shown in Figure 2 as follows [5].
As an example of a knowledge network for aggregator and solver functionality, for example, an ODP Covid-19 patient typed in the search engine "Female ENT specialist near Sidotopo open Saturday BPJS insurance decongestants". This question will be difficult to find answers because there are various variations of answers with different structures. From this example the query obtained from the keywords is: Gender ("female"); specialization ("internist"); location ("Sidotopo"); operating hours ("Saturday"); insurance received ("BPJS"); and medicine ("decongestants"). Another example is if the user is a health worker typing in a knowledge management facility about handling a case of wet lungs "Pneumonia headache, cough fever, drug Rimantadine Amantadine observation chest radiography". This question will be answered by a piece of search engine, it can be about Rimantadine and Amantadine drugs or precisely about chest radiography procedures. From this query keywords can be mapped: Definition ("Pneumonia"); Symptoms ("headache", "fever", "cough"); medicine ("Rimantadine", "Amantadine"); diagnosis ("chest radiography"). Described in the entity-attribute relationship as follows:

![Knowledge Graph](image)

**Figure 2.** Flow Chart of the Use of Knowledge Graph

However, answering the query is very high because the use of natural language phrases results in low search volume, although it is much easier to be ranked and converted. In fact, natural language phrases have been more easily converted to 2.5x better results than using a single key. The bad thing is that complex questions will be difficult to answer if all the specific details needed are not saved as related entities. To truly "speak the language" of a search engine, an entity needs
its own knowledge graph to store its own facts, all mapped to one another. This is the basis for increasing artificial intelligence in information piles and answering complicated questions wherever users will search. By doing so, search engine knowledge graphs (KG) can draw on stored personal knowledge charts - enabling users to manage information at a large scale and provide very specific answers expected by customers, both on the KG user site itself and throughout the experience. third party.

From Figure 1 it can be seen how the Knowledge Graph flows from the source of content, entity taxonomy, to the database and grouping of entities to the formation of a knowledge network graph. In the flow of knowledge graph utilization will enable interaction because of the existence of AI that can be integrated in various IoT-based devices which of course can also accommodate NLP. In the second illustration it can be seen that the medical knowledge network is needed to answer the query of a health worker handling pneumonia cases. Even though patient handling is critical, it requires agility and agility. If medical personnel do not find the reference sought after several clicks through different pages, they are likely to give up if they cannot find the information. They have been trained by Google, Alexa and Siri that specific questions provide direct answers, but most websites cannot replicate that experience. And what do most users do when information is not easy to find? They give up, get back to where they were supposed to start - search engines.

Benefits of Knowledge Graph include [6]:

a. Understanding of context
   Natar relations information gives a better understanding of how things are related and in accordance with each other so that it gives a more accurate search results.

b. Natural Language based search
   Charts store information such as how people talk. Integrating graphics in search makes natural language search easier to implement.

c. Structured and Unstructured Information
   Graphics allow integration of structured and non-structured information so that users can search for data and content at the same time.

d. Aggregation
   Graphs allow for the aggregation of information from many different solutions so that search results can display various information formats that exist in several locations and places.

Knowledge graph combines action-oriented search, faceting, and machine learning. Action-oriented search is generally seen in Google and other search engine results. Faceting includes navigation based on taxonomy and metadata that allows users to filter search results to find information quickly. Whereas Machine Learning improves how content can be tagged and search results can be displayed.

3. Methodology
This study conducted by searching the literature and sources of relevant and up-to-date information on the internet related to the issues discussed for later analysis. The flow chart of the Knowledge Graph as an Accelerator in handling Pandemic Covid19 is as follows and illustrated in a flow chart:

1. Gather sources of information and existing literature, both from books, the internet, pre-existing papers, personal and other people's experiences, as well as other material related to this topic.
2. Conduct a critical review and assess the relevance of the source of information.
3. Make a resume or summary of important points from each of the relevant literature.
4. Writing a draft paper and rearranging the important points that have been obtained in a structured manner into a paper.
5. Evaluate papers that have been made and make corrections if needed.
4. Results and Discussion

The implementation of Knowledge Graph in the two previous examples is that the patient (user) looks for the location of the woman doctor specializing in internal medicine closest to his location and the medical staff (user) looks for a referral for treatment, pneumonia case. However, knowledge utilization and functionality can be broadly applied to the acceleration process of handling the Covid pandemic19 and at the same time addressing the social impacts arising outlined in the following brainstorming:

1. Parenting, teaching children, homeschooling, creating creativity programs and skills at home.
2. Looking for freelance work for workers affected by layoffs. On the contrary, it makes it easier for employers / employers to find casual workers through location and geotagging / geolocation features.
3. Generosity programs and basic food donations for those most severely affected. The donors announced the geo-location and method of distributing groceries, along with the basic food requirements. Then the recipient or affected parties who need to look everywhere can get food assistance.
4. Manufacturers of medical devices that are in excessive stock will easily find the location of clinics or health facilities that really need delivery of medical devices or PPE (eg masks, shoes, ventilators, hazmat, medical gloves, etc.).
5. Geo-location and GIS (Geographical Information System) about criminal events and domestic violence that occurred as well as other forms of social vulnerability due to the Covid-19 pandemic.
6. Decision making by the relevant authorities in handling domino effects due to the Covid-19 pandemic.

A variety of technologies that can be implemented as Knowledge Graph prototypes include:

a. Semantic web techniques use SPARQL-RDF (Resources Description Framework) which is a standard language of computational ontology representing rich and complex knowledge [7]. Ontology formally defines data objects and relationships between human knowledge, by mobilizing semantics through the addition of meaning and context.

b. YEXT: Platform that combines user answers based on Natural Language Processing, fan pages, listings, analytics, and App directory [8].

c. Apache SOLR: developed by Lucidworks which produces an open source conference platform dedicated to Lucene / SOLR. [9]

d. SchemaApp: developed in Canada with the initial goal to empower digital marketers and people who have no previous IT background. SchemaApp takes the main source of structured data from the schema.org web. The analyzer checks the health of structured data on the website provided and notifies you of errors and warnings according to Google's documentation. Enhanced Analytic allows you to report any and all schema.org properties in Google Analytics so that it is easy to understand customer behaviour [10].

e. Google Knowledge Graph: developed by Google, is seen as a systematic way of bringing together facts, people and places, to make interconnected search results more accurate and relevant. Google uses its own database which contains more than 70 billion facts [11].

The challenges ahead in developing this Knowledge graph are as follows:

1. The difficulty of making a strong ontology, mapping domains into graphs that represent the ontology, and ensuring the resulting graphs are compact, accurate, comprehensive, and constantly updated.
2. Graphs that are formed may not be ideal for representing other nuanced meanings of an entity when it appears in different contexts. As in human natural language. For example natural language found in idioms, local dialects, proverbs and personifications.
3. Entries may appear that are not modeled explicitly as nodes because they do not have a known relationship with other entities.
5. Conclusion

Utilization of Knowledge Graph enables search results that are more accurate, interactive and closer to human natural language by combining structured, semi-structured and non-structured data. Semantic technology resulting in automatic prediction and prevention approaches has been proven effective in identifying patients at highest risk, and providing consistent and relevant clinical decision support. The increase in accurate predictions from the Knowledge Graph is very broad in its development, not only in the fields of technology, business and health but also in the social field which can help accelerate the handling of the Covid19 pandemic efficiently. Opportunities for integration and combination with Knowledge Map are also wide open to open, find and present new knowledge and related knowledge holders.

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