Incorporation of Cloud Computing Services During the Knowledge Management Life Cycle: An Amalgamated Framework

Ali Ahmad Alawneh*

[1]*Faculty of IT- Department of Information and Cyber Security- Philadelphia University- Jordan; E-mail:* aalawneh@philadelphia.edu.jo

Abstracts: Knowledge has been utilized as a leverage by many businesses organization In the Era of Knowledge economy, as it is considered scarce, valuable and cognitive asset. Accordingly, managing that knowledge is considered a fundamental challenge for business managers to obtain the greatest value from it because of its profound impact on employees, business processes, and products, as well as to give organizations a sustainable competitive advantage in light of the hyper competition between businesses. This study aims to integrate cloud computing services within the life cycle of knowledge management, with the aim of benefiting from the cloud computing services model (IaaS, PaaS, SaaS) as a breaking-through technological infrastructure to support the four processes of knowledge management (discovery, capture, sharing, application). It is expected that the proposed framework will serve as a reference for employees in knowledge economy organizations to infuse cloud computing services within the processes of creating, possessing, transferring and applying knowledge, which will have a fundamental impact on management practices in the areas of planning, problem-solving, decision-making and policymaking.

Keywords: Knowledge, Knowledge Management, Cloud Computing, KaaS, KMaaS, IaaS, PaaS, SaaS.

1. INTRODUCTION

Today's organizations need to develop and employ disruptive technologies to exploit knowledge in order to stay competitive, add value, enhance organizational learning, making it possible to solve problems online and obtain useful knowledge from many sources and meet business challenges in the dynamic dispersed business environments. Knowledge is “a collective of insights, understandings, beliefs, behavioral routines, procedures and policies which are concerned about markets, products, technologies and processes” (Li et al., 2012). An effective KM approach must take into account areas of focus KM strategy and expertise, adaptable structures for generating and distributing knowledge, systems, processes, and knowledgeable professional staff (Dave et al., 2013).

KM is a "process that helps organizations identify, select, organize, disseminate, and transfer important information and expertise that are part of the organization’s memory and that typically reside within the organization in an unstructured manner"(Yaghoubi et al., 2011). It is also described as "the organization's planning, organizing, motivating, and regulating of people, processes, and systems to guarantee that its knowledge-related assets are enhanced and efficiently utilized."(King et al., 2008). Kim, Lim, and Mitchell (2004) defined knowledge management as "the methodical means of administrating this valuable resource, by promoting an incorporated approach to identifying, capturing, structuring, organizing, retrieving, sharing, and evaluating an enterprise's knowledge assets".

ICTs are being accessed differently because of the revolutionary "disruptive" technology known as cloud computing. The company is not required to purchase or invest a lot of money in the server or its maintenance. For the storage of data, cloud computing provides real-time access to shared resources situated anywhere on the planet. Service available when needed represents a significant paradigm shift from conventional (Sari & Kurniawan, 2015). To get over the difficulties associated with traditional IT, cloud computing offers several advantages. These difficulties include establishing accessible and dependable servers, networks, services, storage, and applications (Chrysikos & Ward, 2014).

Cloud technology improves cooperation, adaptability, expansion, and availability while offering the possibility of cost savings (Dave et al., 2013). It facilitates the possibility to obtain useful knowledge from many sources of cloud delivery models.

The ability of cloud computing to provide consumers with complex and highly effective yet simple and easy-to-use computing resources and information, which was otherwise not so easy to obtain, are some of the reasons why

cloud services are being used more and more for KM. Technological progress has led to widespread fast internet connectivity decreasing the cost of data hosting the rapid international spread of handheld phones with intelligence. These elements have contributed to the requirement for straightforward, reasonably priced, and changeable information (Dave et al., 2013).

Due to the significantly reduced time, expense, and efforts required, the cloud computing model offers a fantastic way to acquire and disseminate knowledge (Khoshnevis & Rabeifar, 2012).

New information and communication technologies (ICTs) strategy that wishes to change how individuals and organizations view ICT as a service is cloud computing technology. This technology has a significant impact on the functionality of knowledge management processes. Cloud computing offers a platform to make data, information, and knowledge available on-demand. It also offers a single site to control data, information, and knowledge. Among the advantages of combining cloud computing with a knowledge management are cost savings, a willingness to try new things, an openness to new business models, and the ability to offer knowledge as a service (KaaS) (Rafiq et al., 2014).

2. TRADITIONAL IT AND KNOWLEDGE MANAGEMENT PROCESSES

IT is defined as both the technological and human sides of computer technology. Particularly, Turban, McLean, and Wetherbe defined IT as “a system represented by a collection of components such as hardware, software, databases, networks, procedures, and people operating within the context of a set of cultural norms and values” (Turner, Douglas & Lankford, William. 2005).

IT may help organizations expand and preserve their knowledge provided the same attention is paid to strengthening the culture and practices of work in organizations to promote knowledge values, without which IT diffusion would be limited. Further, IT must be created with KM in mind, thereof IT as KM enabler's factors are vital infrastructure that enhances the efficiency of KM activities, guide the KM inside the organization, and influence members to share their knowledge and experience with others which in turn leading to augmentation of the organizational knowledge.

The majority of existing KM frameworks describe knowledge processes as a series of steps in a hierarchical manner (Shongwe, 2015). Most of the “knowledge life cycle” concepts are similar and describe KLC as a process consisting of several stages (Durisova, 2011).

Knowledge have a life cycle, thus understanding the life cycle and its dynamics may help managers to better understand KM and identify key knowledge standards as well as methodologies and technologies for managing it (Taskin et al., 2013).

KM system together with the technology platform aims at supporting the KLC resulting in the improvement of individual creation, transfer, and application of knowledge in organizations (Stenholm et al., 2014).

For purposes of this study, knowledge management is defined as "performing the activities involved in discovering, capturing, sharing, and applying knowledge so as to enhance in a cost-effective fashion the impact of knowledge on the unit's goal achievement". Based on the below Figure, knowledge management base on four-phases life cycle out of knowledge is discovered, captured, shared and applied. Figure 1 shows that knowledge locates in various reservoirs includes people such as individuals; artifacts such as practices; and organizational entities such as organizational units. The four-phases life cycle of knowledge management have been enabled via set of sub processes. Firstly, the socialization process which empower the processes of tacit knowledge discovery and sharing. Secondly, the combination process which empower the process of explicit knowledge discovering. Thirdly, the externalization process which empower the processes of externalize and extract explicit knowledge from tacit one, and internalization process which empower the processes of internalize and infuse explicit knowledge into tacit one. Fourthly, the remaining sub processes focus on the methods in which knowledge is directed to others or embedded in practices. These processes are named direction and routines Becerra-Fernandez

et al. (2004). As part of the KM paradigm, there are set of organizational or structural means called mechanisms that are used to facilitate and promote knowledge management, while knowledge management technologies also support knowledge management systems through relying on infrastructure, particularly the information and communication technologies.

Consequently, Figure.1 represents the role of traditional IT for supporting knowledge management processes based upon the technology infrastructure. The aforementioned Four KM processes with their associated sub-processes are aided by information technologies. Technology is a key force behind KM since it transforms different types of knowledge, giving the firm a competitive edge. Utilizing technology, such as information and communication technology, to efficiently manage information and knowledge is the core goal of KM in an organization (Usman et al., 2021). By providing organizational architecture; technology prepares the ground for the exploitation of KM (Ahmadi et al., 2013).

Because KM entails data exchange, technology can be used to perform search, store, update, retrieve, and access data. To enhance interaction, organizations must establish a KM system to connect employees in order to enable sharing their knowledge inside and outside with the help of KM technological infrastructure. KM technology is divided into three categories: (1) knowledge generation tools, which allow for the acquisition, synthesis, and creation of knowledge; (2) knowledge codification tools, which codify tacit and explicit knowledge in a way that allows it to be easily accessed and transferred; and (3) knowledge transfer tools, which eliminate the temporal, physical, and social barriers to knowledge sharing and distribution (Cho, 2011).

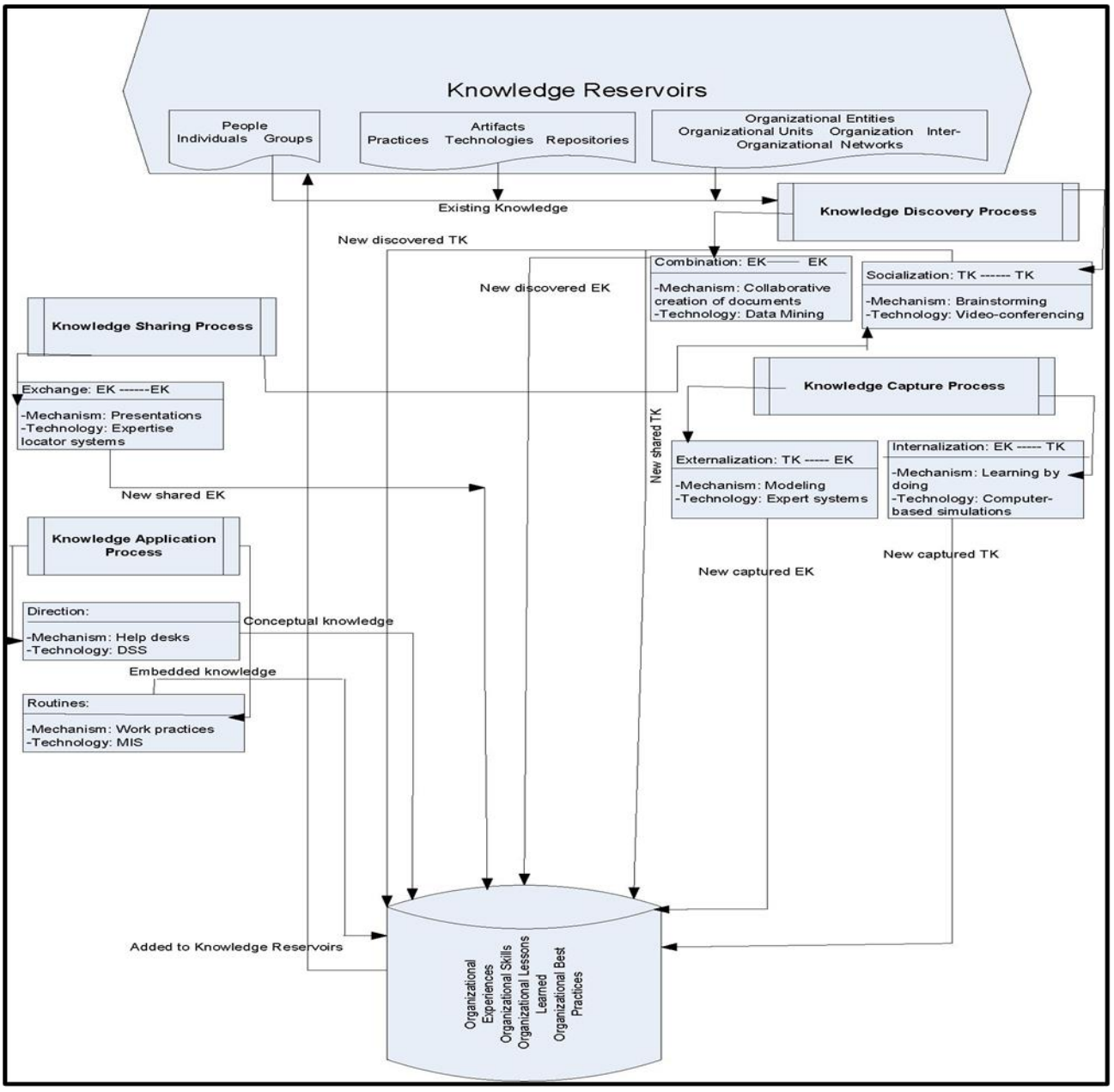

Figure 1: Traditional IT and Knowledge Management Processes Framework (AA Alawneh, R Aouf, 2017).

3. An AMALGAMATED FRAMEWORK FOR CLOUD COMPUTING AND KNOWLEDGE MANAGEMENT PROCESSES

cloud computing is considered "a promising and evolving ICT strategy to change how individuals and organizations view ICT as a service". Also, cloud computing can keep knowledge management up with technology by developing a culture that embraces learning, sharing, changing, and improving knowledge processes.

Cloud computing resources not only offer a hub to create and manage knowledge but also impart a paradigm and platform to make it affordable on demand. Many researchers realized that the integration among the Cloud Computing and Knowledge Management have resulted in reduction of costs, adoption of innovative best practices, exploring creative business models and provide Knowledge as a Service (KaaS) through utilizing the four layers of cloud computing services model (IaaS, PaaS, SaaS, and KMaaS). .

Compared to the traditional IT infrastructure, the cloud computing offers IT services acquired as a service and obtained through a cloud service provider, allowing for convenient global access to a pool of configurable computing resources (Rafiq et al., 2014).

The cloud computing services model architecture can be implemented using a variety of cloud services. Infrastructure as a Service (IaaS) gives users access to essential computer resources such as physical servers, network bandwidth, and other resources (AKSOY & Algawiaz, 2014). Software as a Service (SaaS) as the provider in this instance just permits the users to utilize its applications, from user interfaces and web-based email to other types of apps are used by the software to communicate with the user (Shivaji P. Mirashe, 2011). Platform as a Service (PaaS) is a paradigm for a development and deployment environment that cloud service providers offer to let users advance and deploy their apps (Alhammadi et al., 2015).

Cloud computing has facilitated an exponential increase in the gathering of social knowledge through accessing a multitude of information and knowledge, and producing knowledge. Figure 2 below integrates the knowledge management processes (discovery, capture, sharing, and application) with the four layers of cloud computing services model (IaaS, PaaS, SaaS, and KMaaS).

As shown in Figure 2, the knowledge discovery process occurs through an individual's cognitive process as well as social and cooperative processes. One of the key advantages of cloud computing services is that they can help with knowledge creation, which can improve linkages between tacit and explicit knowledge (Arpaci, 2017).

In the context of knowledge discovery, (PaaS) help knowledge workers with technical know-how may be able to create their apps using the platforms offered to the utilization of PaaS services in KM in the cloud.

Regarding the knowledge capture process, cloud computing helps organizations by enabling pervasive knowledge capturing (Anshari et al., 2015). The most significant areas where technology contributes are storage, hosting, and communication. The expansion of storage space enables KMS to store a variety of knowledge assets, from documents to multimedia files (Mostefai et al., 2015). In the cloud, information is often kept over numerous servers, and storage media rather than in a single location (Bimol et al., 2014). Iaas utilizing the infrastructure for large-scale knowledge storage as well as learning and inference needs processing power is necessary for KM in the cloud (Balco & Drahoova, 2016).

Knowledge is developed and learned, but some of it may be forgotten. Thus, modern cloud storage services can be useful resources for storing and retrieving knowledge (Arpaci, 2017). Cloud computing uses spread storage to keep knowledge, employing backup storage to ensure the dependability of stored knowledge, and to assure high credibility (Zhang et al., 2012). Cloud computing offers a variety of tools for working with the enormous amount of knowledge it stores. Where new knowledge can be found and analyzed to produce fresh ideas that organizations can use (Shorfuzzaman, 2017).

Utilizing the infrastructure for large-scale knowledge storage as well as the processing requirements for learning and inference during KM in the cloud is necessary (Khoshnevis & Rabeifar, 2012).

infrastructure as a service (IaaS) is a data center for the management and control of resources. It adjusts the requirements of the user through the Internet such as network resources, servers, storage devices, database resources, etc.

Concerning the knowledge sharing process, knowledge transfer is the key link in the development of knowledge. How knowledge is disseminated has changed as a result of cloud computing. Knowledge dissemination on the network has changed into a multi-state mode. Cloud computing has created a new type of knowledge. Several channels, including social networking, have advanced global knowledge dissemination (C. Liu, 2015). Technology today allows to dissemination and exchange of knowledge via hardware and software applications. There is also a synchronous technique, such as forums, that makes it possible to exchange knowledge. With the help of cloud computing, employees now have a platform on which to disseminate and exchange ideas while also enhancing the

atmosphere for knowledge exchange (Ibrahim, 2022). It enables the dissemination of knowledge regardless of geographical limitations as long as knowledge suppliers and searchers are available. Knowledge workers can create their apps based on the given platforms using PaaS services in KM in the cloud and obtain knowledge from various sources.

Access is possible from any network-capable device at any place of users' choosing. A user can access knowledge that is saved in the cloud instantaneously by connecting using their smart device, laptop, or desktop at home or work (Bimol et al., 2014).

Software as a service (SaaS) is an application layer for delivered users through the Internet without installing software on devices. It therefore can empower processing, classifying and sharing knowledge based on cloud technology paradigm.

In this layer, People's knowledge can be added to the quantity of organizational knowledge through group interaction and can utilize the great volume of knowledge.

SaaS layer focuses on knowledge maps, interactions and links among experts and knowledge seekers, organization knowledge classification, organization knowledge compilation. SaaS consequently make the workplace for KM more important.

Finally, the knowledge application process implies the implementation of knowledge in directions to people's actions and embedding knowledge in business practices and routines.

IaaS, PaaS, and SaaS are fundamental cloud computing models that can assist organizations to apply new models of KM and supporting the exchange of knowledge (Rot & Sobińska, 2017).

Knowledge Management as a Service (KMaaS) as presented in Figure.2 is considered a new layer to on-demand access the specific knowledge (KaaS) at any time in any location. This new service layer uses cloud computing as a paradigm and technology to ensure the competency of KM processes. In fact, KaaS is a purposeful combination of knowledge processes and organizational mechanisms, structures and systems which enable knowledge management at organizational level. This layer concentrates on efficient utilization of knowledge and information. To this end, this layer imparts the capability for organizations to be more agile, adaptable and accessible to knowledge.

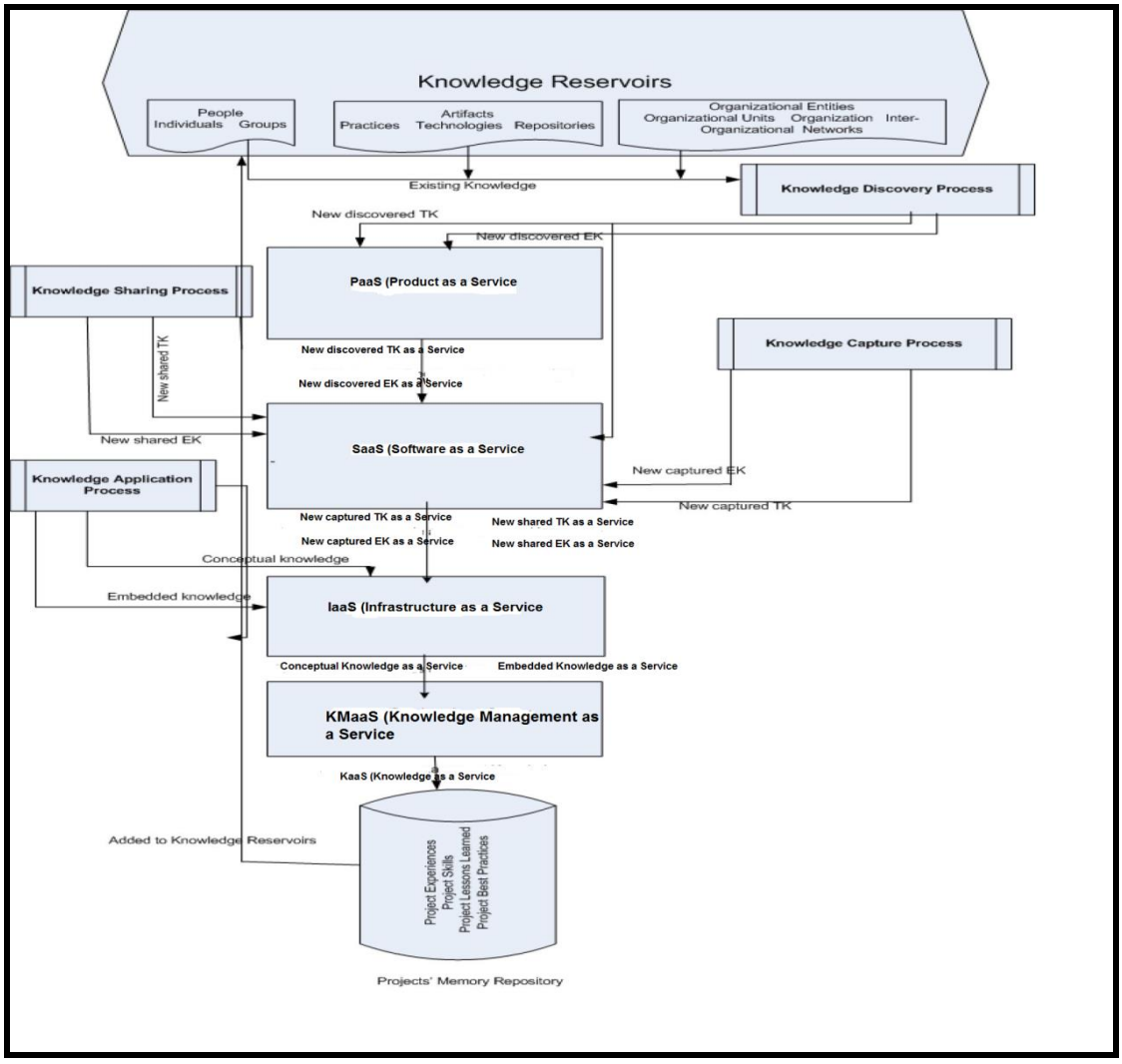

Figure 2: Cloud Computing and Knowledge Management Processes Framework (By Researcher).

CONCLUSIONS

Technical developments in IT create an opportunity to deal with knowledge efficiently, achieve customer satisfaction, gain knowledge, retrieve knowledge easily, and reduce risks and errors. Cloud computing can be used for KM, it can adapt to new technologies and has access to tools that make it easier to share and learn in a highly dispersed and dynamic setting. This study aims to explore the support of cloud computing technology to KM processes through proposing a new framework for integrating the capabilities of cloud computing service architecture model within the knowledge management processes.

As such, cloud computing not only offers an impressive paradigm to process data, generate information and manage knowledge, but also provides a platform to deliver them on- demand, in addition to other IT resources (communication networks, hosting servers, computing storage devices, software applications and computing services). The proposed framework of integration cloud computing with knowledge management is expected to empower organizations to reduce operational costs, adapt of innovative practices, discover new business models, and provide knowledge as a service (KaaS – Knowledge as a Service). The study illustrates the architecture of KMaaS (Knowledge Management as a Service) along with detailed services and associations and the relations between them. It also analyze how different cloud services model can be used for knowledge management in the cloud environment and predict their application outcomes.

Consequently, the proposed framework elaborates on the role of cloud computing delivery models for enhancing the functionality of knowledge management processes. It is expected that business organizations can utilize this framework for any KM project. This framework will assist knowledge workers to define and assess the most critical components of cloud technologies that would be valuable for practicing KM practices (KMaaS) through discover, capture, share and apply the resulted knowledge (KaaS). Finally, the three delivery models of cloud computing: IaaS, PaaS are considered assisted tools for organizations to develop new infrastructure, mechanisms, techniques and models of knowledge management, collaborate with other organizations and facilitate the sharing and application of knowledge.

As future directions, the authors will be investigating the practical and technical components of the integrated framework by adding new components covering both human and technical aspects and consequently employ it as a benchmark or basis for intelligent model that can be trained on large scale data sets using Artificial intelligence techniques.

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