ISSN 1816-6075 (Print), 1818-0523 (Online)
Journal of System and Management Sciences
Vol. 9 (2019) No. 3, pp. 135-146
DOI:10.33168/JSMS.2019.0309

Implementation of Artificial Intelligence System and Traditional System: A Comparative Study

Jeong Beom Kim
Namseoul University, Head Professor of BigDataAI Master Degree Dept.,
Daehak Ro, Sunghwaneup, Choongnam, Korea
jbkim@nsu.ac.kr

Abstract. The main purpose of this paper is to study about efficient AI project implementation as a case study. For the purpose of successful AI implementation, the project plan should be complete and robust with long term view. The implementation plan includes top management decision, organization and human resource, infra structure for AI system, end user support, and company strategy. The biggest benefits of AI systems are cost reduction, quality improvement, and faster response time. The goal of this study is to provide AI system team members with successful AI project implementation guidelines compared with traditional ones as recommendation.

Keywords: AI, case study, implementation, RPA, big data analysis.

1. Introduction

Artificial Intelligence (AI) is a field of computer science that focuses on solving cognitive problems, primarily related to human intelligence, such as learning, problem solving, and pattern recognition. Artificial intelligence, commonly abbreviated to "AI", may be robotics or the future, but AI is becoming a reality of advanced computer engineering beyond the small robots in science fiction novels. With the recent improvements in statistical computing efficiency, Bayesian has successfully developed several areas in the field of "machine learning". Likewise, as network computing continues to evolve, neural network study can further develop sub-disciplines under the name "deep learning." Both Machine Learning (ML) and Deep Learning (DL) are computer science fields that are derived from artificial intelligence. RPA (Robot Process Automation) is a field of process automation using AI technology which can replace human works. In this regard, AI project implementation is different from traditional project roll out (Kim, 2019).

2. Related Study

Machine learning is the name that often applies to some Bayesian techniques used for pattern recognition and learning. Machine learning is a collection of algorithms that learns from and predicts based on recorded data, optimizes basic utility functions under uncertainty, extracts hidden structures from data, and categorizes data into concise descriptions. Machine learning is mainly deployed when explicit programming is too strict or not practical. Machine learning uses data to generate statistical codes (ML models), unlike general computer code, which software developers develop to produce output by program code based on a given input. Deep running is a type of neural network that is one of the machines running. Neural networks have been studied since the 1950s and may have been studied or used during school days. Neural networks are machine learning algorithms that model neurons in living organisms as they are called neurons. Deep Learning is based on the use of deep-running auto-encoders, which Jeffrey Hinton published in 2006, for preliminary learning of multilayer neural networks. After learning dropout and activation function, which can be called learning study, it became possible to learn realistic calculation amount of neural network with several hidden layers. Deep running is a machine learning using a multi-layer neural network, and new detours are still appearing. We look forward to seeing what neural networks are coming. Introducing feature quantities that characterize data in machine learning is a very effective means. There are various types of learning methods in machine learning (Scott and Smalley, 2003).

Map learning is a learning method that learns the correctness and correctness of each data when learning. The goal is to be able to output appropriate classification and numerical values in unknown data as a result of learning. Bid map learning only uses data that does not have correct answer information. You do not need the correct answer and only have the data, so you can collect the learning data easily. You can use it for exploratory work because it can be used at the unknown stage. It is difficult to equip the learning data with the correct answer. On the other hand, in non-word learning, there is no need for correct answer, and it is easy to gather data, but there is little or no way to reflect the desired intent. Thus, there is also learning of a ring that progresses learning with data having a small amount of correct answer to data that does not add a large amount of correct answers. Finally, reinforcement learning is a learning process in which the system is rewarded by the environment according to the result of selecting an action, which improves the behavior and adapts to the environment through trial and error (Smith and Waterman, 1981).

As the 4th industrial revolution is emerging in all industry, many companies and government organizations have been implementing big data system project with high expectation. Also the technology level of AI (Artificial Intelligence) is getting improving, similar projects are being implemented. These days many companies are keenly interested in RPA (Robotic Process Automation). RPA is one of the AI

implementation methods which is getting popular in many successful cases. RPA is a AI solution that some vendors have been emphasizing, Beyond the digital innovation organization, senior executives, and even the working staff often referred to as the 'generic' technology. From finance and manufacturing to distribution, to food, to public, it is a popular phenomenon. Below figure show the landscape of artificial neural network which is a basis of RPA (Negnevitsky, 2017).

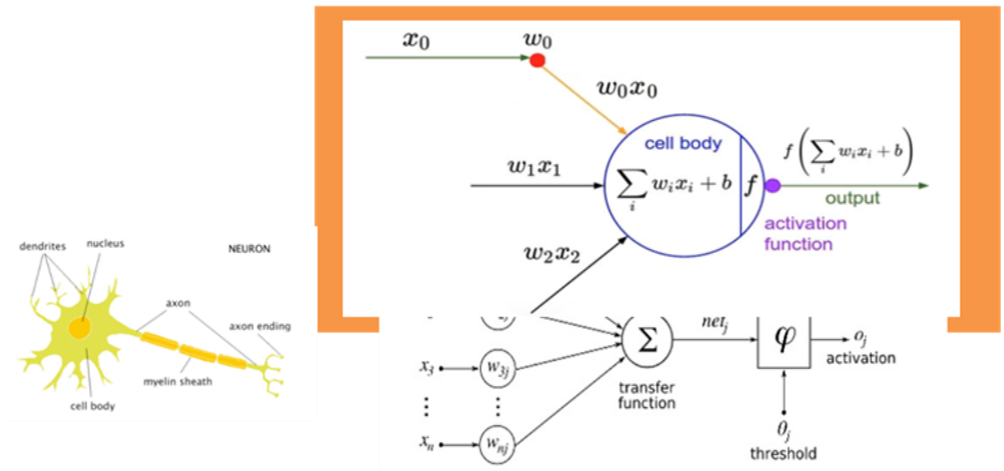

Fig. 1: Landscape of Artificial neural network.

3. Critical Success Factors for the AI Implementation

There are several CSFs (Critical Success Factors) for the implementation about AI project. First one is top management decision for the AI utilization which is related with business strategy with long term vision. Second one is organization and human resource. Third one is infra structure. Fourth one is support from end users. Fifth one is company strategy (Nalwa, 2003).

3.1. Top Management Decision

Top management should recognize the value of AI utilization matching business performance. Also, top management must aware the implementation strategy of AI system and AI project roll out plan. When building an AI system, it's best to find the processes that are most likely to have positive business impact. This greatly increases the likelihood of successful business process upgrades. The role of top management is to find out AI system implementation priority discussing with AI project team.

3.2. Organization and Human Resource Regarding AI Project

Without organization and proper human resource, AI implementation is impossible and end up with failure. Before roll out of AI project, company should set up AI

organization and human resource which are AI specialist team who have enough business domain knowledge and AI technology back ground. Not relying with outside consultant, company should develop and keep AI specialist internally with long term vision and perspective view. Also, company should operate change management team of AI project to upgrade and expand the AI project co-working with business end users (Jansen *et al.*, 2004).

3.3. Infra Structure about AI System

For the successful AI implementation, company should invest in infrastructure which include H/W and S/W. Concerning H/W, company should be equipped with Hadoop, Spark, GPU processor and cloud computing. AI related S/W means package and algorithm for the proper AI project. One of the best ways of successful AI implementation is to do the AI project with AI special consulting company which meet project goal with enough consultant members who have equipped with business domain knowledge and AI technology as well as project experiences. Below figure shows about AI infra structure.

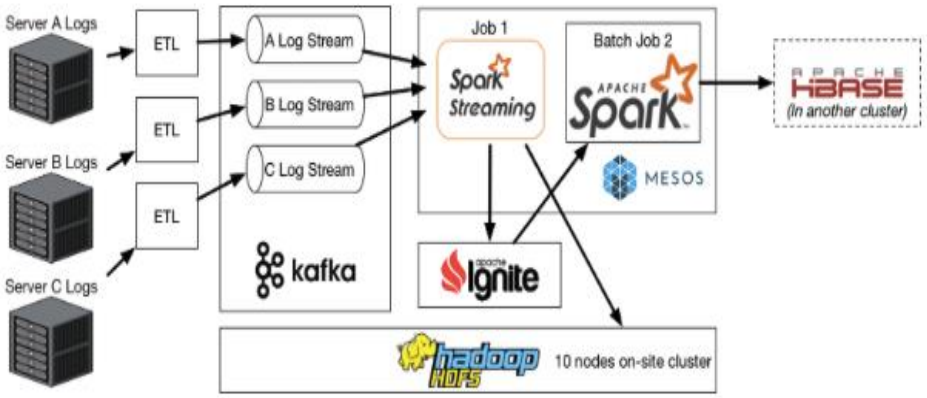

Fig. 2: Big data system with AI architecture.

Using standard cross-validation approaches for training, coordination, and test models can result in incorrect or inaccurate results. This is because they do not adequately mimic the nature of the data coming in during the deployment phase. To correct this, you must imitate how the model is used at deployment time. Data engineers should use time-based cross-validation to validate the trained model against newer data in terms of time. One of the important tasks of data engineers is to regularly deploy AI systems. Data engineers need to test AI system regularly to find out what's missing and fix it. As we focus our company on improving the customer experience, we need a solution that will eliminate this administrative task and give our customer service representatives time to focus on customer claims. A solid test strategy is essential to ensure that data engineers complete both positive

and negative tests when designing their learning data. One of the important tasks of data engineers is to regularly deploy AI systems. They need to test to find out what's missing and fix it. Below figure shows the structure of big data and AI system.

As we focus our company on improving the customer experience, we need a solution that will eliminate this administrative task and give our customer service representatives time to focus on customer claims. A solid test strategy is essential to ensure that data engineers complete both positive and negative tests when designing their learning data. To verify that desktops can meet infrastructure requirements. It is also important to perform performance tests using legacy systems in desktop automation. Below figure shows the AI infra and environment (Kim, 2017; Kimura and Shibasaki, 1995).

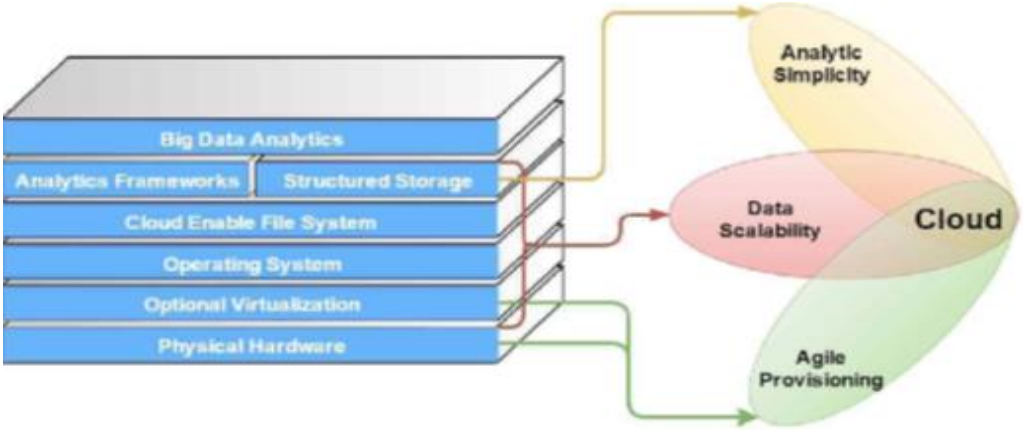

Fig. 3: AI ECO (infra and environment).

3.3.1. Consideration factor about infra structure

When doing the design phase of AI system architecture, ABD (Artificial Intelligence Based Design) should be considered as top priority. ABD contains below five tasks. The first one is to consider the characteristic of server system which are server resources and server expansion capability. The second one is to consider the network environment which are network separation, network traffic, data transfer. The third one is considering the S/W deploying environment which are to choose what kinds of S/W, distributed environment, and category of support services. The fourth one is considering the service environment which are to design business logic, target of service, service purpose, and service deployment environment. During the design of service layers phase, analytic service environment, forecasting service environment, inference service environment, and personal service environment. The fifth one is considering the optimization of S/W environment which are the volume of S/W in one server, how to minimize the dependency, and harmonization of each S/W (i.e. data collection, adaptable to cloud environment etc.). The sixth one is design of business process which are data

business process, design for streamlined data handling, data collection, and data store policy. It is a good idea to carefully review the data and the experts involved in the subject to gain insight into the data and the creation process behind it. Often this process can identify data quality issues related to records, functions, values, and sampling. Data engineers can improve predictability by understanding the nature of the data and creating new features to eliminate existing ones. One of the fundamental roles of machine learning is to represent raw data in a rich functional space that can effectively utilize machine learning algorithms. 'Function change', which develops new functions based on existing functions through mathematical changes, is a popular method. As a result, the functional space (i.e. the set of features used to characterize the data) captures many complex characteristics of the data (such as nonlinearities and interactions between them), Automation within the machine learning process can, in many respects, integrate the principles of AI for data engineers or developers, and relieve the burden of building models that algorithms think and learn. Tight combination data engineers with machine learning is crucial to success of AI system implementation, especially when the model is essential to the job. And the accuracy, sophistication, and scalability of the underlying technology are top priorities for easy machine learning. Below figure shows the framework of AI machine learning (Gollmann *et al*., 2006).

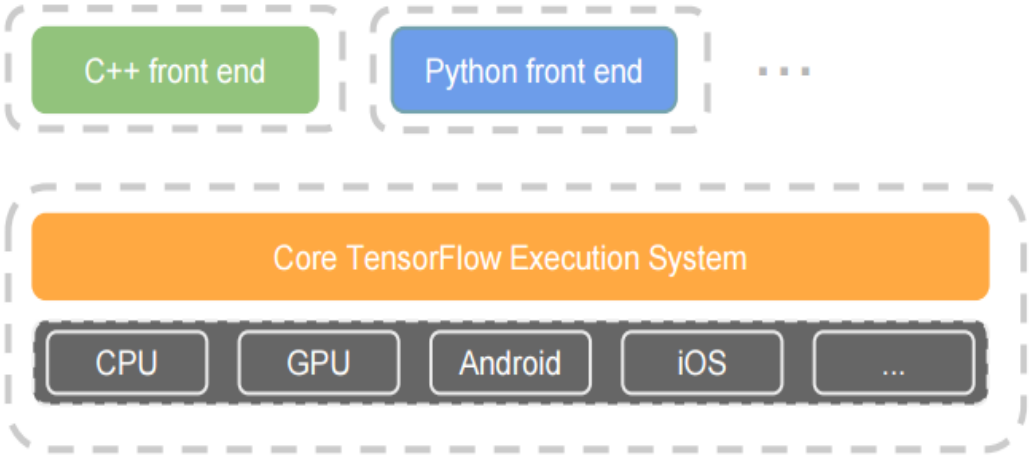

Fig. 4: AI Machine learning frame work.

3.3.2. Consideration factor about infra structure

There are several consideration factors for AI system architecture. The first one is collection part which is to consider network separation environment in network design phase, data pre-processing with ETL/ESB/Crawling Agent, data architecture for structured data/semi-structured data/unstructured data, data source from DBMS/NoSQL/HDFS, and personal data de-identification from the view point of security data handling. The second one is to consider storage which are deployment

of DFS (Distributed File System), DFS configuration, securing of safe storage place. DFS system is definitely needed for the store of large volume data and accumulated learning data. DFS configuration contains Grid file system, Hadoop DFS, AWS S3, and in –memory DFS. The calculation of storage volume is total of daily stored data x store days x compressibility rate. The third one is to consider the analysis system which are analysis for KPI (key performance index), AI service, and decision making. KPI analysis includes configuration of statistics analysis environment, AI analysis environment based on statistics, GPU (general processing unit) analysis environment. AI analysis service includes real time service, batch service, and personal service allocation. AI analysis also contains decision making purpose with real time basis. The fourth one is to consider result visualization with related tools which perform information visualization with rule based, meaning network based, frame and mixed type, and ontology based. Rule based visualization is good for the expression of logical meaningful information, and able to be expanded information using graphs. Visualization of logical meaningful information is useful for relationship expression. Visualization of frame and mixed type is good for the mix of frame and rule. Ontology visualization can render semantic and learning model expression. The fifth one is to consider machine learning training system with enough training data. Without proper training data and training system, we cannot expect good performance from the AI system. More data in the algorithm makes it more accurate system. Limited training data may not support the model complexity needed for the problem. Through the functional laws of statistics, we can get everything we have, not secondary samples, if possible. Choosing the best machine learning method for a given is the key, and it also determines success and failure. For the most accurate results always, the best fit for the characteristics of the algorithms should always be used. In general, a project should find the best value for each parameter to achieve the highest accuracy for a given data set. Data engineers will have to worry about determining cross-validation scores and determining which parameters to try next while training multiple models for best results. The machine learning model may be the same as the data. Improper data collection and cleanup can reduce the ability to build predictable machine learning models that can be generalized. By handling the appropriate training and test data, you make the test data appear as incoming data when you deploy the model to the product (Stallings and Brown, 2012; Lim and Baek, 2011).

With the help of open source environment, current algorithm can enhance pre-training, drop-out and rectified unit function. Pre-training function do the pre-train by layer with initialization to avoid over fitting. Drop-out function does the drop out some node in conducting training. Rectified function can replace sigmoid function resulting in decreasing vanishing gradient effect. Below figure shows the flow of AI learning system (Cho, 2003).

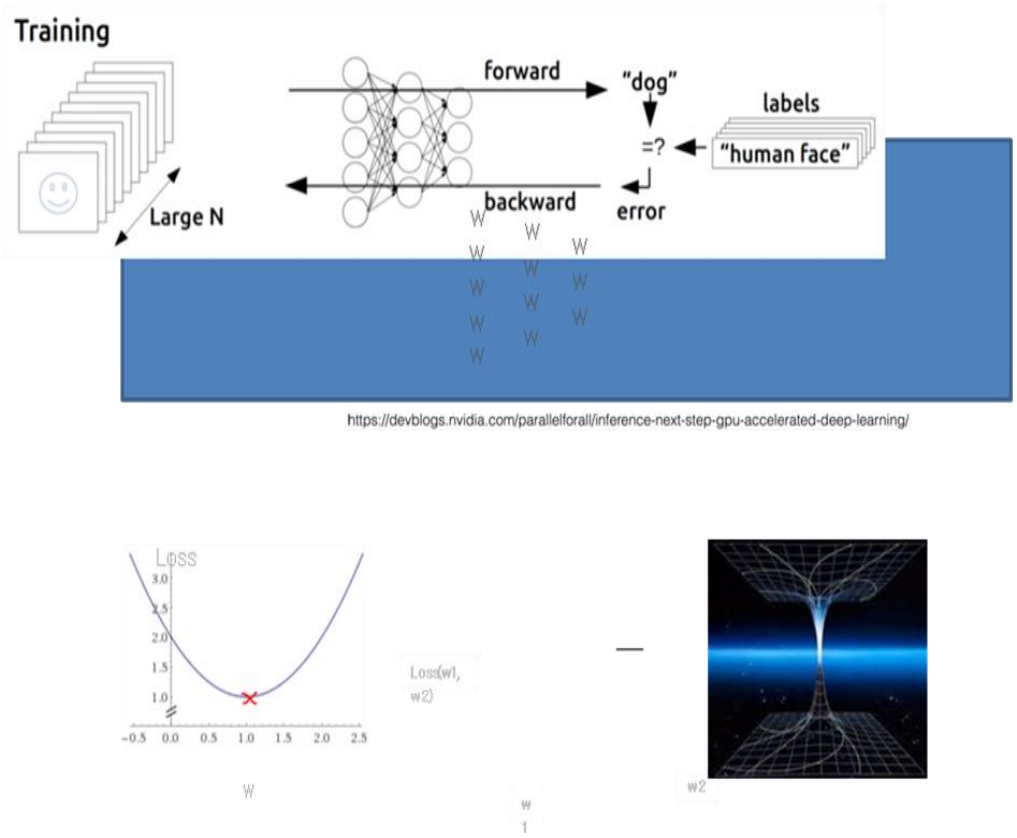

Fig. 5: AI learning system flow.

3.4. De-identification and Security

If you concentrate on automating processes when building an AI system, you may overlook security. Service security is very important because transactions are processed at a tremendous rate. The more important business processes, the more righteousness effort is needed in terms of reliability and security.

One of the crucial parts is to de-identify personal information when it comes to personal data handling, De-identification is an action that makes it difficult to identify a specific individual, even if combined with other information by deleting some or all of it, or by replacing some of it with attribute information when there is information that can identify the individual in the data. De-identified information is information that has been de-identified to personal information and has been appropriately de-identified in accordance with the Guidelines for De-identifying Personal Information for a collection of information. Big data information that has been de-identified is assumed to be information, not personal information, so it can be used or provided to third parties without the consent of the data subject. However, although non-identified big data information is assumed not to be personal information, it is possible that information subjects will be re-identified when new

combination technologies appear or the information that can be combined. The data combination analysis system is a system that generates information by combining, analyzing, and processing personal information or usage history information by an electronically set system. The generated personal information data is information generated through the operation of a combination, analysis, and processing system, and information that can identify an individual and data that can be identified by combining with other information. Such big data must be re-identified if necessary, to prevent regeneration of personal information in the process of integrating or analyzing non-identified information, so that it can be free from legal regulations.

3.5. Support from End Users

Support from end users is one of the most crucial success factors for the AI implementation. In any way end users should be involved in AI project to gather the requirements from them. AI system should be easy to use, reliable and available from end users' perspective points. Also, education about AI system is very important to secure ROI (Return On Investment) with specific end user manuals. Most machine learning algorithms deal with data in a functional space that represents an object, with a set of functions that each describe the characteristics of the object. Indeed, instead of being introduced into the set in this format, data is often introduced in raw form and must be made in the desired form for consumption of machine learning algorithms. Data engineers need to know how to use various computer vision techniques to extract various features, or how to apply natural language processing techniques to characterize text. In this regard, data engineers should co-work with end user to get and understand end users' data which is mostly raw type data.

3.6. Company Strategy

Along with top management decision, there should be company strategy about AI project roll out plan in connection with investment and company cash flow. Company strategy must include ROI analysis and AI project plan with long term view. Investment in AI system can be one of the competitive edges as company strategy. Choosing an appropriate function of AI system that matches your enterprise value is critical to the ultimate success of company goal. Almost all machine learning algorithms are expressed as optimization problems. Properly setting or adjusting the objective function of optimization based on the characteristics of the company is key to the success of machine learning. For example, SVM (Support Vector Machine) optimizes the error of generalization for binary classification problems by assuming that the weights of all types of errors are equal. This optimizes certain types of errors, such as fault detection, but is not suitable for cost-sensitive issues. With the right enterprise solutions and enhanced automation, developers can do everything from model building to deployment using highly accurate machine learning best practices. As AI technology continues to

evolve, it is important to keep pace with change. As the introduction of AI technology increases and more human labor is digitized into organizational capital, AI technology will either provide more advanced cognitive capacities or be more tightly integrated with cognitive functions. Future AI advances are likely to lead to self-building robots, voice control and interaction, and advanced learning capabilities to address more exceptions and subtle differences. The proliferation of process automation due to AI technology can lead to difficulties for organizations to manage automation.

4. Performance Index for the AI Implementation

Combined with company objective, AI implementation plan should include performance index as a achievement target. During the project, the AI team leader should review and check this regularly and report to top management to get strong support from them. In this study, performance index can be analysis by portion as below table.

Table 1: Performance index

< Major performance index >	
Major Index	Portion (%)
Top management decision	40
Organization and human resource regarding AI project	20
Infra Structure about AI system	20
Suppot from End Users	10
Company Strategy	10
Remarks) This index can be different in some company or organization..	

5. Conclusion

The biggest benefits of AI systems are cost reduction, quality improvement, quick response time. The goal of this study is to provide AI system team members with successful roll out guides as considerable factors. In summary, the most important factors of AI project implementation should be aligned with business purpose and objective. The effective AI system must be considered ROI invested cost, reliability, availability, and easy to use. And change management, by communicating with end users, should be deployed efficiently. To do the effective AI project implementation, the total diagnosis and guidance from outside consultants is strongly recommended from the beginning stage. To set up a effective AI learning system, it is necessary to repeat learning system to solve the problems that enterprises face with machine

learning algorithms. Only then, company or organization can maintain solid machine learning algorithms. The more learning data in company, the better result company can get. Therefore, it is necessary to collect the accumulated data in order to succeed in building successful AI system.

There are some Critical Success Factors) for the implementation about AI project. First one is top management decision for the AI utilization which is related with business strategy with long term vision. Second one is organization and human resource. Third one is infra structure. Fourth one is support from end users. Fifth one is company strategy. There are some limitations about this research that should be considered. Firstly, the verification of this conceptual framework about this research model through questionnaire and data analysis needs to be more diversified through other organizations. Secondly, application of this research in different areas such as other corporations could also help for the purpose of extending the validity of these success factors. Thirdly, due to the limitation of time and research work, not all of the various factors are discussed in this study.

The next step of this paper will be to find out the success factors about implementation in real cases with enough survey data focusing on business result and performance.

Acknowledgments

Funding for this paper was provided by Namseoul University.

References

Big Data Computing Technology. (2016). *Hanbit Academy*, 14-31.

C. D. Scott and R. E. Smalley. (2003). Diagnostic Ultrasound: Principles and Instruments. *Journal of Nano technology*, 3(2), 75-80.

Dieter Gollmann. (2006). Computer Security. *John Wiley and Sons. Ltd*, 27-31.

H. S. Nalwa, Editor. (2003). Magnetic Nanostructures. *American Scientific Publishers, Los Angeles*.

H. V. Jansen, N. R. Tas and J. W. Berenschot, (2004). Encyclopedia of Nanoscience and Nanotechnology. *American Scientific Publishers, Los Angeles*, 5, 163-275.

Hyojin Lim, and ShinHye Baek. (2011). Security 3.0, *IDam*, 40-42.

IBM project management report. (2004). 02.

J. Kimura and H. Shibasaki. (1995). Recent Advances in Clinical Neurophysiology. *Proceedings of the 10th International Congress of EMG and Clinical Neurophysiology, Kyoto, Japan*, October, 15-19.

JeongBeom Kim. (2019). Case Study about efficient AI (Artificial Intelligence) Implementation Strategy. *Journal of IJARBMS (International Journal of Advanced Research in Big Data Management System)*, 3(2), 1-6.

Michael Negnevitsky. (2017). Artificial Intelligence. *Addison Welsley*.

OkGi Kim. (2017). Data Science, *Ezies Publishing Co*, 52-55

Smith, T.F., and Waterman, M.S. (1981). Identification of Common Molecular Subsequences. *J. Mol. Biol*, 147, 195-197

William Stallings and Lawrie Brown. (2012). Computer Security, *PEARSON*, 377-382

WanSoo Cho. (2003). Information System Security, *HongReng Science Publishing Company*, 264-283.