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Artificial Intelligence based Strategic Human Resource Management (AISHRM) for Industry 4.0

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Abstract

Industry 4.0, known as industry revolution 4.0, is going to be a business environment in which the labor market will get replaced by machines that can think like humans. Value chains of companies will get interconnected with data. Robots with artificial intelligence will be performing operations that were previously done by humans. Further, those will achieve more accuracy and efficiency in such activities. With this revolution, companies require to focus more on strategic human resource management, as human capital is going to be a much more valuable asset in industry 4.0 where organizations will be able to create sustainable competitive advantage through human capital. Artificial intelligence (AI) is going to be the fuel in industry 4.0. AI based machines will represent the majority of the labor force. This paper is to introduce AISHRM conceptual model which stands for the use of ?Artificial Intelligence based Strategic Human Resource Management for industry 4.0?. This conceptual model developed based on the strategic human resource management theory of ?resource-based view of a firm? or ?resource advantage theory?.

Index terms— artificial intelligence, industry 4.0, strategic human resource management, the resource-based view.

1 I. Introduction

lobalization has generated significant level of challenges to business organizations. Global level interconnected processes and dynamically changing customer expectations has created a highly competitive market place. Innovations and technology adaption have become requirements for creating competitive advantage among the industry rivals (Hecklau, Galeitzke, Flachs & Kohl, 2016). **??**right, Dunford, and Snell (2001) have identified the requirement of human capital for an organization to have a sustainable competitive advantage among rivals rather than conducting human resource management (HRM) as a mere organizational process (Sajeevanie, 2015). Research findings of the last two decades have converted traditional HRM into strategic management which gave birth to Strategic HRM (Yang & Lin, 2014).

According to the definitions given by (Beer, 1997; Dyer and Holder, 1988), strategic HRM is aligning HRM policies and activities with the organizational strategy (Yang & Lin, 2014).HRM reflects organizational policy on the recruitment process, career development and performance management, compensations, employee relationship, safety, and health management, and employee mobility management (Jia, Guo, Li, Li & Chen, 2018). Therefore, aligning above mentioned activities with organizational strategy is the path for an organization to achieve a competitive advantage with human capital. Artificial intelligence has become the trend and component of improving the efficiency of HRM activities with technology involvement (Jia, Guo, Li, Li & Chen, 2018).

We are at the transition age of industry 4.0, which is being defined as the era of interconnecting people and machines with big-data. Data Exchange will be done through continuous digitization and digital transformation of the value chain with artificial intelligence. In this environment of an organization, machines, and objects which involve with the organizational process will be able to learn and change behaviors independently (Hecklau, Galeitzke, Flachs & Kohl, 2016). The value chain of organizations in industry 4.0 will get profoundly based on artificial intelligence, and it will bring up sectors like data science. Significant changes in business models are

required to change how strategic HRM is functioning currently, not only to manage the human work but also to decide where people should work and where machines should work (Liboni, Cezarino, Jabbour, Oliveira & Stefanelli;2019).

2 a) Concept of the study

Jay **??**arney (1991) states from the resourcebased view (RBV) theory or resource advantage theory which has built a sustainable background to strategic human resource management (SHRM).

RBV shows ability of an organization to build unique, sustainable competitive advantage by strategically aligning the talent acquisition and development of resources with organizational strategy (Colbert, 2004). Industry 4.0 is an industrial age where organizations optimize their production through smart value chains that get service from intelligence machines. The environment will be having continuous optimizations Year 2020 ( ) G through machine learning from algorithms that are being connected with artificial intelligence (Shamim, Cang, Yu & Li, 2016).Accordingly, human capital development will be a factor that organizations in industry 4.0 should focus on as a corporate strategy with appropriate HRM with management approaches that are compatible with industry 4.0.HR practices like training, staffing, compensation, performance appraisal, job design should strategically drive organizations into learning and innovation. These are the factors that will ensure sustainability in industry 4.0.These activities should have continuous development cycles that use the learnings from past cases (Shamim et al., 2016). According to the model (Figure 1), HRM activities that aligned with the corporate strategy should improve with learning and knowledge management and improve not only peoples' capabilities but also management approaches as a continuous cycle (Shamim et al., 2016).

Artificial intelligence (AI) defined as algorithmic components that learn through environment and cases and improve its ability in decision making and labor processing with the support of analytics and a knowledge base. AI can bring cost-effective methods for management that will improve according to the latest experience.AI can bring benefits to an organization from an economic perspective by continuous improvement of efficiency in all aspects of HRM and as it will become the new trend for HRM in the future (Jia et al., 2018).The concept of this paper is improving SHRM for industry 4.0 with the usage of artificial intelligence based on SHRM theory of resource-based view.

3 b) Purpose of the study

Even though artificial intelligence has developed and digitized a significant level of manual work from the HRM industry, systems, and tools that are focusing on strategic HRM are significantly low. The main problem is the lack of research conducted to define a framework for AI and SHRM based on SHRM theories (Jia et al., 2018). According to the resource-based view of SHRM, organizations should be able to ensure alignment of resources for the organizational strategic direction and how the organization increase human capital to have a sustainable competitive advantage (Colbert, 2004). In this paper the author is focusing onthe above problems to define AI framework targeting industry 4.0

4 c) Problem Significant

While human capital is going to be the highly valued capital of an organization in industry 4.0,it is going to get a significant challenge from following social problems, lack of young labor force, that is not sufficient to replace the retirement age workers, young knowledge workers placing more importance on factors such as work-life balance, influence in virtual work patterns, the requirement of learning and development throughout their job life cycle, the increment of skilled based jobs and reduction in the labor job market and minimization of continues work requirements **??**Hecklauet al., 2016).

According to the Price Waterhouse Coopers' 11th Annual Global Survey, 89% of CEOs admit the acceptance of the "People agenda" into their considerations for the strategy. Hewitt's survey **??**2008) shows the need of the majority of companies to focus on top talent as the proposition of economic decline (Beechler & Woodward, 2009).The above factors show the requirement of an AI framework for aligning HRM activities from industry 4.0.

5 d) Methodology

This paper focuses on discussing and reviewing the literature of case studies, and journal articles about artificial intelligence, industry 4.0 and strategic human resource management. Web-based articles and information of latest evolving startups if human resource based AI software products also taken in to review.

Therefore, the literature review is the research tool used for this concept paper. Finally, the author is introducing the conceptual model for artificial intelligence for strategic management aiming at industry 4.0. For this conceptual model, author get the support of resource based-view of a firm theory of strategic management and competitive advantage. From this concept paper, author is tiring to conceptually fill the literature gap of using artificial intelligence for strategic human resources management.

6 II. Literature Review a) Artificial intelligence

AI is a software engineering domain that is developed based on cognitive science, which is emerging with research in areas of machine learning, natural language processing, Robotics, and image processing (Lee et al., 2018). During the past few years, due to the development of machine learning ability of AI, a significant level of algorithmic developments has contributed to getting AI for more industrial aspects (Jia, Q et al., 2018). Due to the drastic development of AI,a new era of labor has exposed to the globe, which are machines with human thinking patterns. Success of this algorithmic innovation can being measured through the enormous victory that "Google Alpha GO" AI chess player took against South Korean chess player Lee Sedol (Silver et al., 2016).

According to Rich, E. (1983), artificial intelligence is constructing a pathway to make machines do things that humans do more wisely. However, according to the information availability and computational power and algorithmic advancement, AI has developed into a way that machines can do things accurately and efficiently than humans (Jia, Q et al., 2018).

The core of AI is big data analysis, which is the major contributor for the development of AI. Other than big data, cloud technology, domain knowledge, and cases are the key elements of AI that use with industry level. According to the current AI frameworks, the productivity growth that organization gets from AIbased automation is still at a significantly low level. This is not only based on the productivity paradox but also due to the growing market demand and competition. More than the productivity growth, industry 4.0 needs revolutionary changes because of emerging changes in technologies such as big data analytics. Industrial internet of things will convert operational flexibility and efficiency into significantly high level in an eco friendly way (Lee et al., 2018).Figure 2 shows a comparison of the industrial AI system with other learning systems, and it indicates the requirement of this industrial AI framework for operations of industry 4.0. Organizations have been practicing HRM as a separate management practice, and it was not a factor that considered in developing the corporate or business strategy of an organization. Jim Walker (1980) was the first to suggest to have a human resource plans for the business strategy of the organization and this was the eye-opener for SHRM (Wright, Snell & Dyer, 2005). The literature of Schuler (1992) Dyer and Holder (1988) establish that strategic HRM needs alignment to the company's corporate and business strategy with HRM.

From this concept, accountability of HRM decentralize as an organizational activity and not as a part of HRM department (Sajeevanie, 2015).

SHRM is created based on two factors namely how does an organization align resources with current strategies or adapt new strategies which effect to change the strategic direction and how does an organization create or give more strength to competitive advantage by strategically build and renew human resources? (Colbert, 2004) while Beer, M. (1997) stressed the importance of investing in human resources as a strategy for a competitive advantage over the global competition (Sheehan, 2005).The main difference between HRM and SHRM, HRM also called as technical HRM that covers conventional functions which are recruitments, training, career developments, performance evaluations and appraisals where SHRM is focusing on empowerment and career management of employees and align them to a corporate strategy, while converting work-place into high performance work place which directly focuses on achieving company goals (Yang & Lin, 2014).

Considering the theoretical background of the SHRM, which needs to implement SHRM in an organization, resource-based view or resource advantage theory has received a significant amount of attention in the literature. An organization should inspect from resource side from it (resource-based view of a firm) rather than product side of it and they suggested using resource position barrier metric, and resource product metrics as a tool to measures the strategic position of an organization (Wernerfelt, 1995). According to Maijoor & Witteloostuijn (1996), the resource-based view of a firm is a strategic management theory that provides a way to recognize the resources of the organization that can build sustainable competitive advantage.

Resources of an organization are not limited to people; it is about skilled people, brand names, machinery, etc, (Sajeevanie, 2015). RBV shows that organization can add value to its competitive advantage by acquiring, growing and merging not only human capital but also physical and organizational resources and converting to the sustainable competitive advantage that will be difficult to copy for competitors (Colbert, 2004).

7 c) Industry 4.0

Term industry 4.0 represents industry revolution 4.0 occurring as a result of the current speedy development of the high-tech industry. Industry 4.0 describes the business world that people and machines are interconnected with real-time data and get fed through adigitized value chain. According to the based background provided with artificial intelligence, machines will be able to increase efficiency by learning human patterns (Hecklau, Galeitzke, et al., 2016). Predictive maintenance (PdM) of a factory is being considered as a key feature of industry 4.0.

According to Shamim et al., (2016), industry 4.0 is a development of a cyber-physical system for production, connecting machines via sensors, and smart manufacturing to the value chain. Here, the author shows value of the human resources in industry 4.0 as all the above-mentioned tasks need continuous innovations done by skilled human resources. When considered the human resources perspective of an organization, industry 4.0 will face a number of socioeconomic problems such as lack of skilled staff for maintaining the business, aging society with later retirement, cost reduction pressure, and short product life cycle (that requires different skills and also effect change) will become the main problems. Out of which most critical challenge would be the aging society. Because of not having attractive strategies to attract the young generation to the labor market, there will be very

short of young people in the labor market to replace the retirement-age people. Young people who are entering the market also critically consider work-life balance and flexibility of work with virtual environments. Further, lifelong learnings will be attractive values to keep skilled young staff in an organization (Hecklau et al., 2016). Industry 4.0 implies changes in the way human relations (human to human), changes in the way that people involved with organizations and also changes in the way people get involved with innovations and technology (Liboni, Cezarino, Jabbour, Oliveira & Stefanelli, 2019).

8 d) Using artificial intelligence to strategic HRM in industry 4.0

According to the above literature, industry 4.0 is going to be a business world where machines are connected with data and work efficiently than people in the production process. The labor market will get replaced by robots that can work independently. Every job is going be a different job as jobs will require a different set of skills. But there will be important skills with increased demand, and salient and those should get developed by the human resource management function (Hecklau et;. Even though industry 4.0 represents the era of advance and intelligent production, the base of this era would be HRM . Sivathanu and Pillai (2018) states that HRM process like recruitments, development of skills should align with the business strategy of an organization. It also mentioned about the need for problem-solving skills that will be highly required to manage the internet of things (IoT), Big data, and AI .

Summarizing the above, the author is going to find solutions from artificial intelligence for solving human resource issues in industry 4.0to enable companies can create a competitive advantage according to the resource-based view. Recruitment and knowledge management -as a solution for lack of skilled staff and aging problems in industry 4.0. Robotic process automation-as a solution for cost reduction pressure /short production life cycle and aging of workforce.

The target of industry 4.0 is to work with robots and other devices that have human thinking while efficient than humans and that are connected to each other with big data to increase the efficiency and productivity of the industry with less cost (Rusydan, Ibrahim & Hassan, 2019).In the business environment of industry 4.0, selecting the best-skilled staff for the organization should be the strategy for HRM to ensure that the company will drive towards sustainable competitive advantage (Colbert, 2004). Submitting paper-based curriculum-vita has got replaced by online job portals, and into electronic formats and these has absorbed by millennials. Electronic profile activities and data such as Facebook, LinkedIn has become the base of candidate selection process and HR managers currently using social media and professional networks such as LinkedIn to do the headhunting. According to Reilly (2018), AI has simplified the process of selecting suitable talents to the company by providing efficient and more accurate platforms that lead to a better relationship between the applicant and the employer (Rusydan, Ibrahim & Hassan, 2019). The screening process and decision making about the talent and skills that align with company strategy will be the strategic HRM task that any company would expect in industry 4.0.The ideal corporation who are into artificial intelligence-based software development shows how it can reduce the biases of candidate selection process with data screening and decision-making support with AI while reducing the recruitment cost by 70% (Jia, Q et al., 2018).

However, Dennis M (2018) shows the danger in using AI in ethical decision making by giving an example from college recruitment."Even though AI is reliable in pattern recognition and computation, it cannot replace human " . However, we can directly argue with the article as AI has the power of pattern recognition and learn from cases and identify new patterns better than humans. The best part of AI is that it is filed with big data and analytics and machine learning system (Colbert, 2004), which can develop by past recruitments and success and fail cases.AI that uses for strategic HRM should focus and also get learning from HR analytics emerging in the HRM industry. Mc Kenney describes their development of feeding HR analytics into machine learning algorithm to identify behaviors, patterns and identify and predict employees at risk of resignations. Based on big data gathered at of series of the exit interview and ongoing HR data tracking, one of their customers has cut down $20 millions of retention bonus and also has reduced unwanted attrition (Lippens, Schaninger & Tanner, 2019). Above factors illustrates the need for HR analytics as a longing process with AI-based strategic HRM for industry 4.0.

From the Sri Lankan context, companies who are into AI-based strategic HRM software development ("C-SUITE HR," 2019) show evolvement of their career guiding bot "SIA" in to HR analytics based AI solution for strategic HRM. It analyses the data from the graduate level, and as a career guidance bot, it shows a career path according to the skills of the candidate. Analysis and prediction will get done not only based on their preference but also by analyzing social media context and series of interview inputs from the candidate and also from interview words. It shows how it captures HR analytics of a particular user throughout their career and provide a prediction for the organization ("Sia," 2019).

Another main challenge for HRM in industry 4.0 is cost reduction pressure and aging staff that will not get replaced by the younger generations. Cost reduction will be a high considerate factor in industry 4.0 and it will be a pressure to provide product level completion (Hecklau at el., 2016). Therefore, HRM should align with absorbing knowledge and skills from existing labor and conduct operative trainings. More than that HRM, should consider costs solutions without large scale recurring cost. Robotic process automation is not an application or

process. It is a way to replace a human from a particular task by automating the process through technology. RPA is a combination of IT and HRM, and it has become a part of people's life such, as SIRI and Alexa as personal assistance. Artificial intelligence here is going to become a critical layer in RPA in developing the future workforce (Rai, Siddiqui, Pawar & Goyal, 2019). RPA is a technology that enables companies to configure bot or robot that can perform tasks or processes in a higher efficiency (compared to human) without humans' involvement (Rai, et al., 2019).

Leslie Willcocks, Mary Lacity, Andrew Craig (2017) from their paper on "Robotic process automation: strategic transformation lever for global business services" shows "Xchanging," a insurance company based step by step process automation with RPA. Looking with a resource-based view of a firm, organizations should consider to develop and train their resource as same as an accusation, to build a competitive advantage. Therefore, an organization should get the service of cyber-physical agents to capture data from the workforce (Chiu, Cheng & Huang, 2017). SHRM should consider developing training programs and handover and take over process automation and identify where a machine can work better than humans and make the cost reductions. In the paper "Robotic process automation -Automating the automation" done by Blitz technologies mentioned that RPA is the next technology that needs human judgment (Rai et al., 2019).But, as we can see from above literature RPA will be able to run with high-level of HR analytics that can gain through cyber-physical agents and align it with company strategy with resource-based view and stretching the algorithm through AI that is capable of handling aging staff and ease off the cost reduction pressure for a company.

In the past decade we saw onshore workforce changing into offshore while reducing cost by four times. But with RPA same tasks can be done less than half the price of offshore cost, but still, all work will get done onshore. Data production, according to the performed tasks, will get passed to the analysis process for the efficiency improvements and then feed again to the production floors with increased efficiency (Rai et al., 2019). There can be efficiency limiting factors by product types and according to environment variables. Therefore, this analysis done through the AI algorithm in RPA process accuracy will be high as it does not take human involvement. Therefore, this RPA should provide feedback for the resource plan which should always need to align with the corporate and business strategy of the organization (Rai et al., 2019).

9 III. Conclusions

To implement Artificial intelligence-based SHRM for industry 4.0, it is a must to implement an industrial AI framework that can learn with a systematic learning approach. According to current AI and machine learning system, it will need a process to identify the expert level and provide updates. Therefore, AISHRM system that is proposing in this paper should base on industrial AI framework. To be in competitive business by building sustainable competitive advantage, an organization should focus on AI algorithms that will not only update people skills but also whole management strategy by learning from past cases.

HR analytics should be a key player in this AISHRM framework throughout the life cycle of employee and organization child needs to consider about machine learning algorithms and skills people that have skills in high end AI algorithm development as a competitive advantage. HR analytics consider as the nerve system of the whole AI SHRM system of the organization. It should be able to identify patterns that cause for resignations and low performance and feed those particular data to AI algorithms to gain more accurate predictions.

When it comes to resources in industry 4.0,similar to human resources, machines also need to be considered as resources that require learning and training; handover takes over process, and analytics. AISHRM process should be a framework that covers all aspects of HRM, and beyond otherwise, organizations will not be able to get the expected return on investments. It should start with on or before the recruitment process to screen and make decisions about talent selection. This output and learnings should store in a central knowledge base. The output from appraisals and other HR analytics should also save in a central knowledge base to compare with recruitments and learn and update the AI algorithms for the next phases of selections. SHRM should always analyze to identify what to convert from RPA and what is not. These decisions should always align with the corporate strategy of the company.

Main Tasks for AISHRM process in industry 4.0 should start with automated talent recommendation. This function includes reading electronic curriculum vitae and scrapping social media and professional network data, analyzing the cyber-space behavior of particular candidate, connecting to other HRM systems via Application Interfaces (API), conducting the initial selection of interviewees through an automated gaming and psychological tests. Automated hand over take over process (HOTO) by learning from cyber agents and past cases this automated agent will be conducting HOTO programs and provide recommendations with percentage of particular process knowledge of the user and areas of high skills and low skills as the next task of the process. Working condition tracking, conditions that motivate and increase productivity and decrease motivation and productivity. This module also has does self-learning with cyber-space articles and also results from a work-place should consider as an ongoing task.

Automated tracking on performance, efficiency, patterns of work, both humans, and machines and update knowledge base. Cyber-physical agents will be a part of this tracking process. This module is a supportive module for other processes of the organization. Strategic training and developmentswhich focus on the work tracking and analyzing available resources inside and outside of the organization will provide recommendations on what kind of process that can automate with RPA aligning with the organization strategy and conduct

training for humans and also for machines for particular operations. Analyzing patterns of people -this module will show details about people that are at risk of resignation and demotivated and percentages of risk of losing and replacement level and cost whether it is aligning with the business strategy of the company.

The strategic alignment module should include analysis about overall human resource strategy and strategic fit for the corporate and business strategy and deviations. There data should also transfer to the knowledge base for learnings. Information from this module will be able to use to decide whether the company should select a new strategic choice or build a sustainable competitive advantage among the industry rivals. [1]

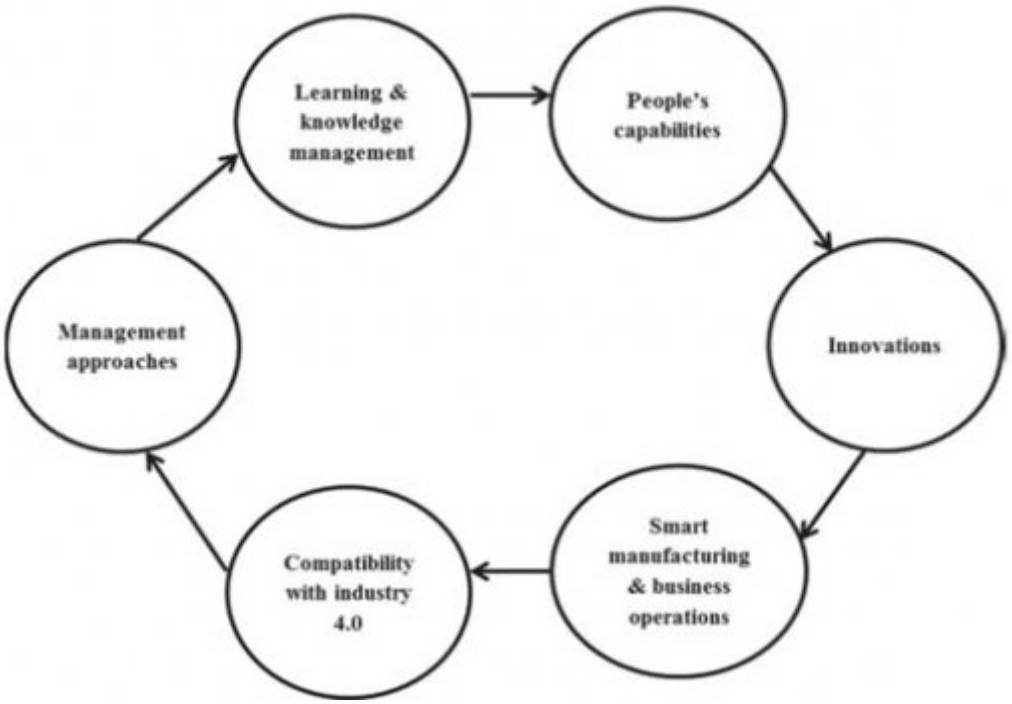

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Figure 1: Figure 1 :

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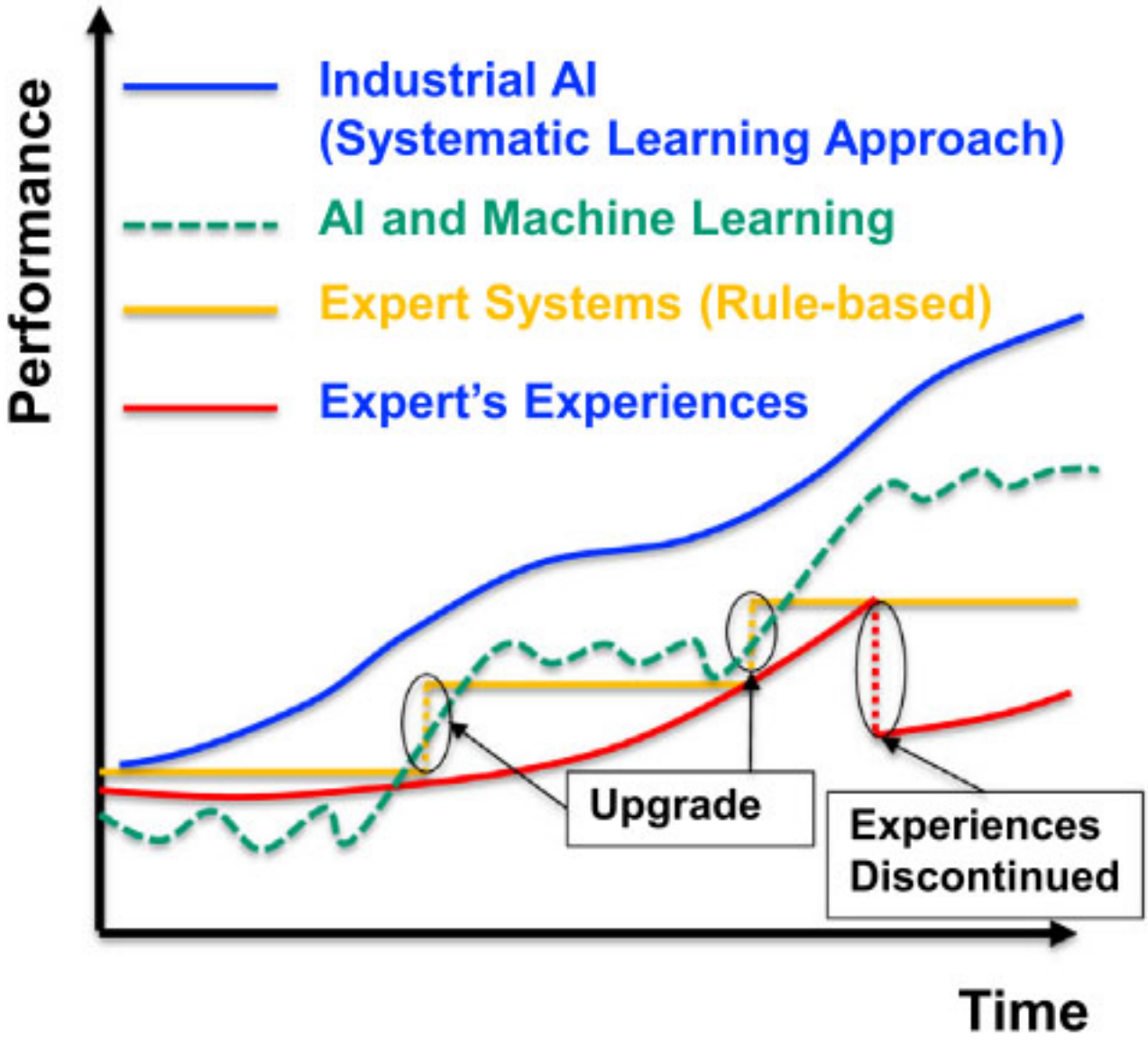

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Figure 2: Figure 2 :

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