Human Resource Development in the Age of AI

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Abstract

As we move towards the "Super Smart Society" outlined in the Society 5.0 initiative proposed by the Japanese government in the 5th Science and Technology Basic Plan, new human resources are expected to play an active role in solving various social issues by utilizing artificial intelligence (AI) and thereby creating new value. Today, a worldwide shortage of AI specialists has pushed companies into intense competition with each other to secure competent AI specialists. To deal with this problem, a more aggressive approach to developing human resources specializing in AI is required. At NEC Group, we have been working hard to develop human resources specializing in AI since 2013 and many future AI specialists have passed through our workplaces. Based on a case study of NEC Academy for AI, this paper shows how we develop our human resources in the age of AI.

Keywords

human resources specializing in AI, data scientist, human resource development, NEC Academy for AI

1. Introduction

Over the past few years, rapid progress in the social implementation and utilization of AI, as well as increasing digitization of the economy, has led to a growing shortage of qualified AI professionals around the world. Japan is no exception. The problem is severe enough that the government has stepped with the Cabinet Office proposing the principle of education/literacy as one of the social principles of AI, encouraging academia, industry, and government to work together to develop human resources for AI. In "AI Strategy 2019", introduced by the Council for Integrated Innovation Strategy, it is recommended that everyone be encouraged to gain a basic understanding of AI, mathematics, and data science. In a digital society, it is not only important to develop skilled AI professionals, but also that everyone have an awareness of the power and limitations of AI.

At NEC, our approach to human resource development starts by dividing the people who would be involved with AI into three layers (**Fig. 1**). The first layer is comprised of AI researchers who would be engaged in R&D of cutting-edge AI algorithms. The second layer consists of people who would conduct social implementation of AI at IT companies and user companies. Finally, the third layer is composed of ordinary people who would utilize AI in society at large. Ultimately, AI is expected to be implemented by all businesses — big and small. Unfortunately, the people needed to carry out this task are simply not available today, which makes development of AI-specialized human resources a matter of critical importance.

This paper focuses on the second layer — the people who will implement AI in society. These are the people

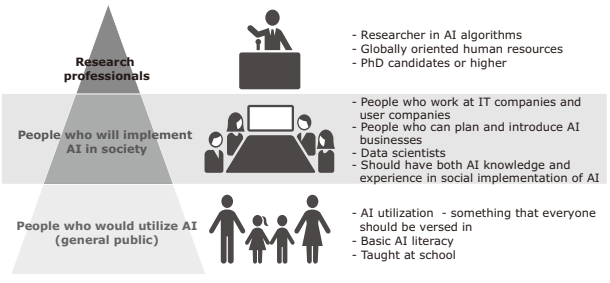


Fig. 1 The three layers of people involved with AI.

who will be most in demand, the people who will install and operate AI systems in businesses and public organizations. Introduced below are the points to be considered and human resource development policies based on a case study at NEC Group.

2. People Who Will Implement AI in Society

Implementation of AI involves five phases: survey, planning, verification, introduction, and utilization (**Fig. 2**). In the survey and planning phases, business issues are studied and appropriate AI projects are developed. In the verification phase, the value brought to the business when AI applied is studied and assessed. In the introduction phase, an AI system is built that incorporates the AI technology whose value has been verified in the previous phase. In the utilization phase, the AI system that has been built is put into practical use in a business.

The skills required for social implementation of AI differ depending on the phases. According to the skill definition of the Japan Data Scientist Society, business competence is needed in the survey and planning phases, data science competence is needed in the verification and introduction phases, and business competence is again needed in the utilization phase.

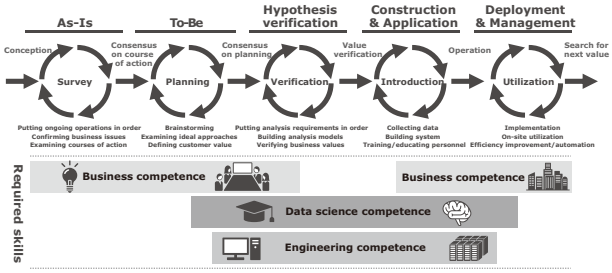
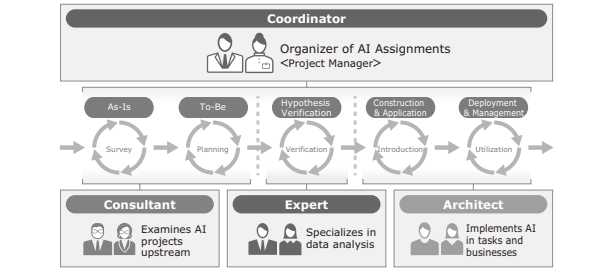


Fig. 2 AI implementation process.



Coordinator	Brings together the consultant, expert, and architect while assuming responsibility for the entire AI project and assuring that customers get the full value of AI.	Expert	Designs approaches for hypothesis verification. Requires knowledge of data science (statistics and mathematics). Builds analysis models to achieve customer value.
Consultant	Addresses customer issues and demands and defines value that can be achieved with AI. Requires knowledge of domains (knowledge in business types and details).	Architect	Incorporates verified analysis models into business systems. Requires knowledge of domains and systems in order to support business utilization.

Fig. 3 AI human resource types classified by NEC.

NEC has classified AI implementers into four human resource types (**Fig. 3**). In practice, multiple human resource types with their respective specialty skills will work together to implement AI.

3. Considerations for AI-Specialized Human Resource Development

NEC turned its attention to developing AI-specialized human resources in October 2013 and since then we have trained several hundred people in this field. From this experience, we have derived three main points that we believe must be considered in AI-specialized human resource development.

3.1 A broad curriculum is needed that emphasizes a wide range of skills

As mentioned in Section 2, people specializing in AI require a wide range of skills — including business competence, data science competence, and engineering competence. Which skills need to be emphasized varies depending on the AI human resource types. The consultant needs to acquire business competence, the architect, engineering competence, and the coordinator, general knowledge of business, data science, and data engineering.

Since the required skill set varies according to each human resource type, the AI curriculum must cover a broad range of knowledge. As specialists, the three types of human resources — consultant, expert, and architect — must have the opportunity to obtain deep knowledge in their field, while also gaining fluency in related areas. The curriculum must facilitate this by covering everything from basic theory to applied technology.

3.2 Opportunities for trainees to acquire practical capability are essential

It is also necessary to carefully design the details of training programs. In addition to classroom learning for acquisition of knowledge, practical training — such as hands-on and role-playing — should also be provided. It is not enough, however, to simply provide training programs. AI specialists need real-world experience to give them the practical ability that cannot be obtained through training alone.

Many training programs are limited in duration — ranging from a single day to several days. Issues to be solved and technologies to be applied are generally decided in advance. In real-world AI projects, on the other

hand, a trial-and-error approach is usually required in order to decide what technology is best suited to the customer's needs. In other words, the skills needed to solve preset problems — which is what training programs teach — are not the same as the skills required to solve actual problems by fully mobilizing one's knowledge and expertise. This makes it essential to provide trainees with the opportunity to acquire practical skills.

3.3 Systems for continuous learning are essential

Like all digital technologies, AI technology is constantly evolving. New technologies crop up daily, old ones become obsolete. Keeping up with this rapidly changing technological environment is essential for AI professionals. This means that AI human resource development is an ongoing, open-ended process and training programs must be set up so that personnel who have already acquired general skills can learn new technologies.

Beyond this, ensuring that workers can keep up with this fast-changing AI field requires that opportunities for information sharing and human resource exchange be made possible. Currently, efforts to utilize AI are underway in various industries. It is often helpful to study utilization case studies from other industries in addition to the ones from the same industry. This necessitates a mechanism that enables trainees to learn the latest and best practices no matter what the industry.

4. AI Human Resource Development Policies at NEC Group

To better address the three main points discussed above, we launched the NEC Academy for AI (**Fig. 4**). In this section, we will explain in detail the policies adopted at NEC Academy for AI.

4.1 A place for systematic learning

The NEC Academy for AI offers about sixty courses which enable students to acquire the three skills essential for AI professionals (business competence, data science competence, and data engineering competence) as well as basic skills. Since the required skill set differs depending on the human resource type, the courses are designed that the students can choose the ones that enable them to most efficiently acquire the skills they need (**Fig. 5**). Moreover, collaboration with universities addresses the need to relearn basic theories of mathematics, statistics, and information science.

4.2 A place for practical experience

The NEC Academy for AI is provided with a *dojo* — a place for immersive learning — where students can acquire practical skills by working on real-world actual AI projects. Under the guidance of mentors who are active in the front lines of AI, students receive on-the-job training (OJT) that enables them to acquire the practical experience they need to apply AI to businesses. The only way to acquire the skills needed to solve actual problems is to work on an actual AI project. NEC regards AI human resource training as a combination of classroom instruction for knowledge acquisition and OJT for practical experience (**Fig. 6**).

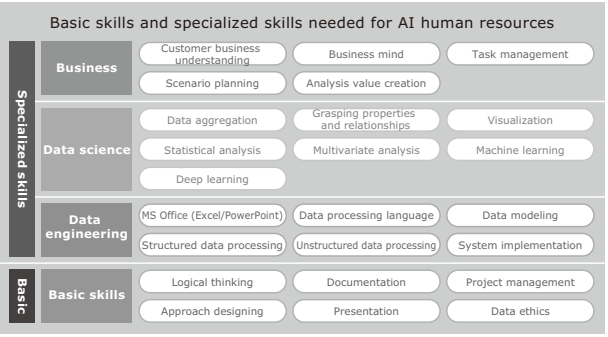


Fig. 5 Skills that can be acquired in the training programs.

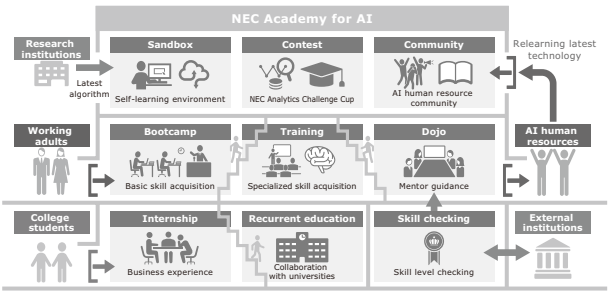


Fig. 4 NEC Academy for AI.

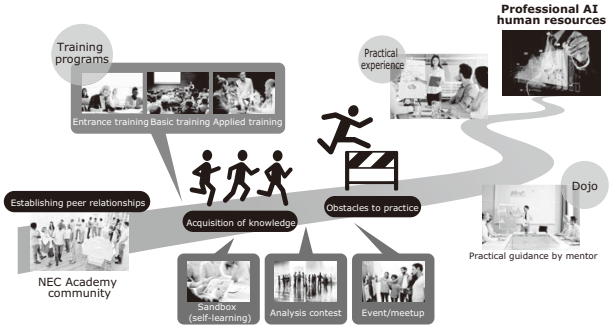


Fig. 6 *Dojo* to enable actual practice (OJT).

4.3 A place for continuous learning

The NEC Academy for AI is also provided with an environment called a "sandbox" where the students can play with a variety of AI systems. These include NEC the WISE — NEC's exclusive suite of AI technologies, as well as open-source software machine leaning libraries and deep learning frameworks. Also available is web video that allows the trainees to self-learn in the sandbox, making it easy for them to acquire relevant knowledge as and when they desire. To encourage students to push the limits, an analysis contest called NEC Analytics Challenge Cup is held periodically in the sandbox to help improve the participants' skills.

By installing new AI algorithms developed at NEC Central Research Laboratories and other R&D facilities in this sandbox, we have built a mechanism where students can stay up-to-date with the latest technology in a fun and flexible environment. The NEC Academy for AI also offers students a "community" where they can cooperate with each other — sharing information and working together on AI projects. This inter-peer exchange provides yet more opportunities for participants to stay on top of the latest AI trends.

4.4 Future prospects

Japan is confronted today by a host of inter-related issues — declining birthrate, aging population, labor shortage, and depopulation of rural areas. NEC has defined the key driver to increase Japan's labor productivity and improve international competitiveness as "AI x human resources" and decided to propose its training methodology to universities, as well as industries. While providing opportunities for students to gain practical experience, to acquire knowledge of mathematics, data science, and AI, and to break down the barriers between science and literature, we are aiming at creating communities where fellow students can work together regardless of age and occupation to learn new skills and develop innovative ideas (**Fig. 7**).

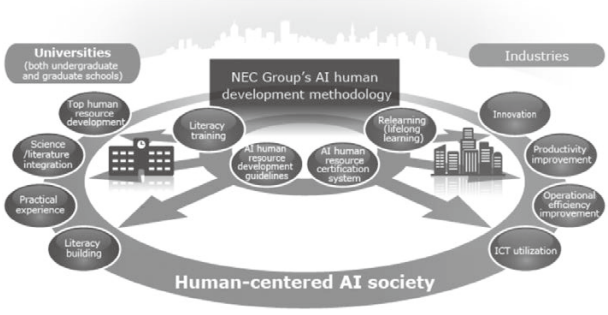


Fig. 7 NEC Academy for AI – Approach to Learning.

5. Conclusion

This paper has discussed the AI human resource development methodology developed at the NEC Academy for AI. Despite the increasingly acute shortage of AI human resources worldwide, developing new AI human resources is no easy task. Because it takes time and money to develop AI human resources, companies are scrambling to attract the best talent. Addressing the growing need for AI human resource development is imperative. At NEC, we are not only committed to develop AI human resources ourselves, we are actively seeking to share our training system with the market and society, in order to help achieve a human-centered AI society which can safely and effectively use AI.

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