국가직무능력 분석을 통한 4차산업 혁명의 교육방향 제안

임성욱* · 윤성필** · 백창화***†

*대진대학교 산업공학과
**한국산업기술연구원
***대진대학교 산업공학과

Suggestion of Education Direction of 4th Industrial Revolution through Analysis of the National Competency Standards

Lim, Sung-Uk* · Yoon, Sung-Pil** · Baek, Chang-Hwa***†

*Dept. of Industrial Engineering, Daejin University
**Korea Institute of Industrial Technology
***Dept. of Industrial Engineering, Daejin University

ABSTRACT

Purpose: NCS(National Competency Standards) is a systematic organization of knowledge, skills, and literacy required for performing tasks in industrial settings. This research aims to search for keywords that are important to us and to present key directions of education for the fourth industrial age in the future.

Methods: The systematic classification system of NCS was investigated and the classification code structure was analyzed. Among them, the frame and structure analysis of the classification code of quality was analyzed using R-program.

Results: This study grasped the quality classification situation of NCS and suggested improvement plan from the operational aspect of the fourth industrial revolution era.

Conclusion: In conclusion, this study suggested the idea of education direction of SMEs(Small and Medium-sized Enterprises) in the era of the 4th industrial revolution by understanding NCS which reflects Korean characteristics.

Key Words: NCS, Co-word Analysis, Knowledge Structure, Management

1. Introduction

The NCS is the knowledge or competencies required from individuals that are engaged in all types of occupations standardized and presented at the national level. The gist of the NCS is to reorganize the curriculums by centering on practices based on the NCS in order to cultivate competent persons that can be immediately inputted into the field. The NCS is consisting of a total of 833 job areas will be completely developed by next year and 250 job areas and 245 job areas will be additionally prepared in this year and next year respectively. The NCS is reorganizing curriculums and making learning modules to help the NCS takes root in the field. Learning module means standard teaching materials that unfolded the contents of theories and practices so that concrete jobs can be learned in order to convert the NCS into school education. Currently, various development teams such as education and training experts, field workers, qualification experts, job analysts, and employers gather to develop learning modules. One NCS consists of an average of 10 core competence units and is usually presented in levels 1 to 8. Higher numbers mean higher levels such as level 8 (doctors), level 7 (masters), level 6 (university graduates), levels 4~5 (junior college graduates), and level 3~4 (specialized high school graduates).

2. Material and Method

The classification system of the NCS represents the stepwise composition of National Competency Standards, centered on the type of job. This presents the overall roadmap for national incompetence standards development. Occupations were classified centering on the Korean Employment Classification of Occupations (KECO) and referring to Korean Standard Occupation Classification and Korean Standard Industrial Classification. The categories consist of 'large categories (24) → medium categories (80) → minor categories (238) → minute categories (887)' in order of precedence. The large categories are divided according to the Korean employment classification of occupations. The medium categories are classified when there are areas with similar types of job functions, areas with similar industries, areas with independently formed labor markets or similar career development paths, or areas with human resource development councils by industry within a large category. Minor categories are classified when there are areas with similar types of job functions or areas with human resource development councils by industry at the level of minor categories within a medium category. Minute categories are classified when there are areas with similar types of job functions or representative jobs among the jobs under the Korean Employment Classification of Occupations within a minor category.

3. Results and Discussion

3.1 Competency Unit

Jobs mean the minute categories under the NCS classification system and standards are developed in minute category units in principle.

The NCS classification system was created by taking into consideration two criteria of NCS development scope and unique according to skill type.

NCS is basically a classification system aimed at standardizing the jobs required by the industry. The upper classification of the classification is classified and given a name covering the lower classification items.

Competency units are sub unis of the NCS classification system and correspond to basic components of the NCS. Each competency unit consists of a competency unit classification number, the definition of the competency unit, competency unit elements (performance criteria, knowledge·skill·attitude), the scope of application, work situations, evaluation guidelines, and core competencies.

Table 1. NCS Composition

Configuration Item	Contents
competency unit code	A serial number given to distinguish between different competency units and expressed in 14 digits
competency unit title	The name of the competency unit is written
competency unit description	The purpose, job performance, and scope of utilization of the competency unit are roughly described
competency unit element	Important core sub competencies that constitute competency units are described
performance criteria	Provide the criteria for the performance that an individual must reach in order to determine the achievement of each competency unit element
Knowledge, Skill, Attitude	The knowledge, skills, and attitudes necessary to perform competency unit elements
range of variable	Ranges and physical or environmental conditions related to the performance of competency units
	Data, documents, equipment, tools, and materials related to the performance of competency units
guide of assessment	Methods of evaluation of whether competency units have been accomplished and matters that must be considered during the evaluation
key competency	Vocational competencies that must be basically equipped to perform duties by competency unit

3.2 Level System

Korea Research Institute for Vocational Education and Training has introduced the Korean Qualification Framework (KQF), which means an integrated level system capable of linking various qualifications (education qualifications, vocational qualifications, etc.).

KQF's research has created models that can reflect the level of all industries. The basic characteristics of the model were the qualifications framework for setting the level for each competency unit based on education and training. However, the opinion that qualifications and education and training do not reflect the job content of the field has been continuously raised, and thus a new level of development has begun.

The new level includes the reflection of the job level of the industrial field, the qualification that can be recognized as an individual's ability, the presentation of education and training, and the avoidance of overlap between levels, which is the level system of NCS.

The NCS level system is systematized levels of jobs in industrial fields and is utilized in the linkage between 'industrial fields, education and training, and qualifications', in the presentation of stages of achievement of life-long learning abilities, and in the composition of qualification level systems.

When the NCS is developed, the levels of competency units and competency unit elements are rated and presented according to the eight-level system.

Table 2. NCS's Level System

Level	Configuration Item	Contents
8 Level	Definition	A level at which the highest grade theories and knowledge regarding the relevant area can be utilized to create new theories, wide-ranged technical works can be performed with the highest grade skills, and authority and responsibilities for overall organizations and businesses have been given
	Knowledge Skill	A level at which the highest grade theories and knowledge regarding the relevant area can be utilized to create new theories and wide-ranged technical works can be performed with the highest grade skills
	Ability	A level at which authority and responsibilities for overall organizations and businesses have been given
	Career	A level that can be reached after continuously working at level 7for approximately 2-4 years
7 Level	Definition	A level at which wide-ranged technical works can be performed with high grade skills utilizing specialized theories and knowledge in the relevant area and obligations and responsibilities are necessary for others' results.
	Knowledge Skill	A level at which specialized theories and knowledge in the relevant area can be utilized and theories and knowledge in close areas can be used and wide-ranged technical works are performed with high grade skills
	Ability	A level at which obligations and responsibilities are necessary for others' results
	Career	A level that can be reached after continuously working at level 6 for approximately 2-4 years

6 Level	Definition	A level at which theories and knowledge in the relevant area are freely utilized within independent authority, diverse tasks are performed, and the knowledge and know-how in the relevant area can be delivered to others
	Knowledge Skill	A level at which theories and knowledge in the relevant area can be freely utilized and diverse tasks can be performed with general skills
	Ability	A level at which the knowledge and know-how in the relevant area can be delivered to others and tasks can be performed within independent authority
	Career	A level that can be reached after continuously working at level 5 for approximately 1-3 years
5 Level	Definition	A level at which quite complicated and non-routine tasks can be performed using theories and knowledge in the relevant area within comprehensive authority and knowledge in the relevant area can be delivered to others
	Knowledge Skill	A level at which theories and knowledge in the relevant area can be used and quite complicated and non-routine tasks can be performed
	Ability	A level at which knowledge in the relevant area can be delivered to others and tasks can be performed within comprehensive authority
	Career	A level that can be reached after continuously working at level 4 for approximately 1-3 years
4 Level	Definition	A level at which complicated and non-routine tasks are performed restrictively using theories and knowledge in the relevant area within general authority
	Knowledge Skill	A level at which theories and knowledge in the relevant area can be restrictively used and complicated and non-routine tasks can be performed
	Ability	A level at which tasks can be performed within general authority
	Career	A level that can be reached after continuously working at level 3 for approximately 1-4 years
3 Level	Definition	A level at which somewhat complicated tasks are performed using basic theories and general knowledge in the relevant area within limited authority
	Knowledge Skill	A level at which basic theories and general knowledge in the relevant area can be used and somewhat complicated tasks are performed
	Ability	A level at which tasks are performed within limited authority
	Career	A level that can be reached after continuously working at level 2 for approximately 1-3 years
2 Level	Definition	A level at which proceduralized and routine tasks are performed using general knowledge in the relevant area under general instructions and supervision
	Knowledge Skill	A level at which general knowledge in the relevant area and proceduralized and routine tasks are performed
	Ability	A level at which tasks are performed under general instructions and supervision
	Career	A level that can be reached after continuously working at level 1 for approximately 6-12 months
1 Level	Definition	A level at which simple and repetitive tasks are performed using basic general knowledge such as understanding of characters and calculation ability under concrete instructions and exhaustive supervision
	Knowledge Skill	A level at which basic general knowledge such as understanding of characters and calculation ability can be used and simple and repetitive tasks are performed
	Ability	A level at which tasks are performed under concrete instructions and exhaustive supervision

3.3 Word- Clustering Analysis

In order to raise awareness and understanding of NCS, the government conducts various publicity and training projects for teachers at schools and vocational education and training institutions at all levels. It also provides guidelines for applying the developed standards. It is actively inducing the use of NCS.

As a result of these various efforts, interest in NCS has been increasing in the field of vocational high schools, colleges, vocational training institutes and industries including meister high schools. Particularly, in the case of vocational training institutes, the training course using NCS is actively operated. Some professional colleges and universities are piloting NCS-based curriculum. It is expected that the development and application of NCS - based curriculum will be greatly expanded in vocational colleges.

If the required job is decided by the educational institution, it is necessary to develop the subject for each job. However, the situation is different when it is an early stage of the policy to develop the task based on the educational institution. In other words, we need to find the most talked-about part of NCS. The purpose of this study was to find the most frequently mentioned words in the NCS classification system and to find out related tasks.

The result of word clustering using the R program is as follows.

Table 3. Word-Clustering Analysis

Rank	Noun	Counts	Rank	Noun	Counts
1	Management	1279	26	Machine	129
2	Design	542	27	Processing	124
3	Establish	362	28	Production	123
4	Analysis	309	29	Preparations	118
5	Working	291	30	Environment	116
6	Development	247	31	Produce	114
7	Plan	212	32	Quality Management	114
8	Equipment	206	33	Support	113
9	Evaluation	206	34	Goods	110
10	System	203	35	Operation	108
11	Planning	199	36	Product	101
12	Operation	193	37	Quality	101
13	Maintenance	178	38	Electric	86
14	Contractors	176	39	design	85
15	Service	153	40	Device	84
16	Airline	152	41	Review	83
17	Check	146	42	Fair	81
18	Write	142	43	Material	81
19	Inspection	138	44	Strategy	79
20	Making	138	45	Corporation	77
21	Install	137	46	Research	77
22	Safety	136	47	Making Plan	75
23	Maintenance	132	48	Customer	73
24	Equipment	131	49	Instrument	73
25	Safety management	130	50	Marketing	70

4. Conclusions

NCS, National Competency Standards, is called "Job Request" in the field in Korea. Therefore, there is a word that is most often mentioned in the NCS can say that the most important word in the industry of Korea. As a result, the management words were repeated 1279 times in Word-Clustering Analysis. Therefore, management ability can be regarded as the most necessary job skill in Korean industry. After that, it is the order of design and establish ability, but if you combine the seventh plan with the eleventh planning, plan ability is more important than establish ability. Considering that Korea is one of the top 10 powerhouses in the global industry, the job skills required in today's industry are in the order of management, design, planning, design and analysis. Therefore, in order to carry out the job ability of the industry, the individual should try to improve the management ability and the design ability, and the government should improve the education environment so that the individual can improve this ability.

When constructing a curriculum, several learning modules may form one subject and one learning module may be divided into several subjects. Alternatively, some learning modules can be partially modified and utilized according to learner and school rating. In addition, some of the interrelated learning modules may be used as a major subject. In the era of the Fourth Industrial Revolution, the method of creating the right curriculum can be partially utilized depending on the level of the learning contents constituting the specific learning module. By using practical NCS module, it is possible to supplement the existing textbook based on theory. In addition, it is possible to supplement the contents of the integrated course of theoretical and practical training or the curriculum based on the actual industrial field. The course will be based on the knowledge and skills of the NCS module used in the curriculum. It can also include literacy or basic vocational abilities that are emphasized in the NCS learning module used in the major curriculum.

REFERENCES

Crosby, J. W. 2011. Test Review: FM Gresham & SN Elliott" Social Skills Improvement System Rating Scales." Minneapolis, Minnesota--NCS Pearson, 2008. Journal of Psychoeducational Assessment 29(3):292-296.

Koss, M. P., Gidycz, C. A., & Wisniewski, N. 1987. The scope of rape: incidence and prevalence of sexual aggression and victimization in a national sample of higher education students. Journal of consulting and clinical psychology 55(2):162.

Dong-Yeon Kim, Jin-Soo Kim. 2013. Analysis of Korea's National Competency Standards(NCS) Development Trends. THE KOREAN JOURNAL OF TECHNOLOGY EDUCATION 13(3):22-46.

Lee, Soon-Gu, Park, Mi-Sun. 2014. The Study on an Enhancement of Tourism Employee Qualification System by the application of NCS. JOURNAL OF TOURISM&LEISURE RESEARCH 26(3):185-201.

Peng, H., Song, H., Chen, B., Wang, J., Lu, S., Kong, X., et al. 2003. Temperature dependence of luminescent spectra and dynamics in nanocrystalline Y2O3: Eu3. Journal of Chemical Physics 118(7):3277-3282.

Azlee Zabidi, Nooritawati Md Tahir, Ihsan Mohd Yassin, Zairi Ismael Rizman. 2017. The Performance of Binary Artificial Bee Colony (BABC) in Structure Selection of Polynomial NARX and NARMAX Models. ijaseit.7.2.1387, 373-379.

Heywood, L., Gonczi, A., & Hager, P. 1992. A guide to development of competency standards for professions. Canberra: AGPS.

Council, A. N. 2002. National competency standards for the enrolled nurse. Australian Nursing Council.

Council, M. 2006. ANMC National Competency Standards for the Nurse Practitioner.

Yates, P., Evans, A., Moore, A., Heartfield, M., Gibson, T., & Luxford, K. 2007. Competency standards and educational requirements for specialist breast nurses in Australia. Collegian 14(1):11-15.

Mulcahy, D., & James, P. 1999. Evaluating the Contribution of Competency-Based Training. National Centre for Vocational Education Research, Australia.

Gonczi, A. 1994. Competency based assessment in the professions in Australia. Assessment in Education: Principles. Policy & Practice 1(1):27-44.