Abstract
In recent days, industrial convergence is playing a greater role for SMEs' business innovation efforts. In practice, however, it is extremely difficult for SMEs to find a structured model or framework to improve their internal competences to level up their industrial convergence capacity. In this paper, a study on the previous related materials and text mining technique based on the materials are performed to identify keywords for industrial convergence competence model. It is then evaluated by the interview and survey of the selected high performers in industrial convergence area. The authors now recommend the first version of industrial convergence competency model (i.e., Convergence DNA) through the research for future improvement and refinement.

Keywords: Business Innovation, Competency Model, Competences Model, Convergence DNA, Industrial Convergence, Industrial Convergence for SMEs

1. Introduction
Age of low growth is now common in every country including South Korea. To actively respond to this external environmental change, companies are trying very hard to innovate their business structure and business model. There are many business innovation techniques such as BPR, 6 Sigma and Technology Commercialization and so on to perform innovation inside the company. One of the recent trends for this innovation movement is through industrial convergence activities.

Korean Government enacted “the Law of Industrial Convergence Promotion” and is encouraging SMEs to adopt industrial convergence as one of the most influential business innovation tools. But in practice, SMEs find it very difficult to follow the recommendation since there are not much practical procedures or available tools for the execution of industrial convergence. As a result, it is required for the Korean Government to provide more practical ways to help SMEs to implement industrial convergence without many obstacles. In this regard, the need for the development of the industrial convergence competency model is strong more than ever.

2. Previous Research on Industrial Convergence Competency Model

2.1 Definition of Industrial Convergence
The definition of Industrial Convergence is still on discussion not coming to one single agreed concept. Oxford Dictionary of English is defining convergence as “the action or fact of converging; movement directed toward or terminating in the same point (called the point of convergence)”.

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In the law of Industrial Convergence Promotion of Korea, it is defined as “the Action that innovates the existing industry or creates new social and market value through creative combination and complexation of different industries, technology with industry and divergent technologies.

Franssmann (2000), Bores et al. (2003) focused on ICT convergence. Gill T2, Bally, N (2005) emphasized the importance of function and process in the industrial convergence. Linda, J (2004, 2005) used market convergence as the same meaning with industrial convergence. Hacklin F. mentioned knowledge convergence as the core of industrial convergence9. In sum, no commonly agreed definition of industrial convergence exists so far.

Various definitions of convergence is summarized in Table 1 below.

A few of the aforementioned authors have tried to categorize convergence on separate levels, on the basis of different points in time or different breadths of actions. For example, Hacklin employs four stages of convergence in his “evolutionary and sequential perspective” as follows: 1. Knowledge convergence. 2. Technological convergence. 3. Applicational convergence, and finally 4. Industrial convergence9. According to his definition, the first is marked by (to an individual firm) serendipitous knowledge spillovers between previously disjoint knowledge bases and leading to a new combination of knowledge sets, initiated by a large scale erosion of isolated industry specific-knowledge11. Accordingly, the ability to enrich

### Table 1. Definition of convergence

| Source | Definition | Industry Scope | Management Scope |
|--------|------------|----------------|------------------|
| Adner and Levinthal (2000, p. 64) | A process of convergence, in which the common domain is an application domain in which one of the two antecedent technologies is already applied | general | innovation through recombination |
| Bally (2005, p. 13) | The growing together of technologies, which fundamentally alters the boundaries of previously distinct industry or market sectors and merges them into a new competitive environment | general | industry and market boundaries; competition |
| Pennings and Puranam11 | Convergence between previously disjointed markets can be viewed as the erosion of boundaries that define and isolate industry-specific knowledge | general | industry and technologies |
| Bores, Saurina, and Torres8 | A process by which the telecommunications, broadcasting, information technologies and entertainment sectors(collectively known as ICT-information and communication technologies)may be converging towards a unified market | ICT, Media | market redefinition |
| Hacklin9 | knowledge convergence denotes the emergence of serendipitous co-evolutionary spillover between previously unassociated and distinct knowledge bases, giving rise to the erosion of established boundaries that isolate industry-specific knowledge | general | knowledge |
| Nystrom (2008) | convergence is a change process initiated by technological, socio-economical and organizational forces, removing or changing traditional industry borders, framing and enabling new resource constellations and eventually leading to industry convergence in the form of subindustries, new business ecosystems and new market | general | comprehensive definition |
| Curran7 | a blurring of boundaries between at least two hitherto disjoint areas of science, technology, markets, or industries | general | management |

Source: Curran7, Hacklin9
conventional food with substances that reach the desired area in the human body and can thus trigger a physical reaction could be viewed as such a combination of distinct knowledge bases. In Hacklin’s line of argument this knowledge would not only relate to the technological knowledge sets of food processing and of drug delivery, but also to the related market knowledge. Consequently, he describes technological convergence as a ‘transition of knowledge convergence into a potential for technological innovation’. Again, it is not viewed as a conscious-driven act, but rather as a partly serendipitous evolution, based on the combination of different knowledge sets. Digitization would be an example of a technological convergence that in his reasoning would not necessarily lead to convergence in the higher hierarchies of convergence. It could also be seen as just a creation of some sort of widely used, generic technology.

On the next step, the application convergence, managers will become a decisive factor. Here they need to spot opportunities for a realignment of their business activities, going further than just the creation of new products/services. Such realignment can be seen in the food industry, where many companies have realized and utilized the potential of the new knowledge and technological capabilities and transformed those into new fields of activity. The final step, termed as ‘industrial convergence’ denotes a degree of convergence, where firms from previously distinct industries are increasingly competing with each other as the industries’ boundaries blur. This is set off by changing business models and value chains and will in many cases lead to increased strategic alliances and M&A activity. The ICT setting serves well as an example for industry convergence. Undoubtedly, different knowledge sets had to be combined to be able to stretch technological developments such as digitization across industries as diverse as camera manufacturers, state-owned telecommunication monopolists and personal computer manufacturers. New business models have been developed by many companies in ICT and several firms have tried to conquer new markets by siding with firms from other industry sectors. Summing up, Hacklin’s views convergence as an ‘evolutionary process’, with each of the steps triggering the next sequential convergence. In his perception these are preceded by distinct knowledge bases, unassociated technologies, intersected technologies and integrated technologies, respectively.

### Table 2. Process of convergence

| Stage                | Definition                                                                                                                                                                                                 | references     |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Knowledge Convergence| Knowledge convergence denotes the emergence of serendipitous coevolutionary spill-over between previously unassociated and distinct knowledge bases, giving rise to erosion of established boundaries that isolate industry-specific knowledge. | Hacklin⁹        |
| Technology Convergence| Technology Convergence denotes the transition of knowledge convergence into a potential for technological innovation, allowing inter-industry knowledge spill-over to facilitate new technological combinations. | Hacklin⁹        |
| Applicational/[Market] Convergence| Applicational Convergence denotes the transition of technology convergence into opportunities for new value creation in such a way, that it with respect to the majority of metrics outperforms the sum of the original parts. | Hacklin¹⁹, Curran and Leker¹⁰ |
| Industrial Convergence| Industrial Convergence denotes the transition of applicational convergence into the shift of industry boundaries in such a way, that firms from previously distinct industries through the emergence of common applicational suddenly become competitors. | Hacklin⁹        |

### 2.2 Industrial Convergence Competency Model Framework

In general, competency model comprises of action of intents like behavior skill, motives, personal character, self-concept, and industrial knowledge. Spencer & Spencer in Achmad S, Rukey stated that competency is a fundamental characteristic that affects individual’s way of thinking and acting, as well as facing all situations...
to this day, virtually little previous research has been done for the development of industrial convergence competency model. Only research on IT convergence competency development is recently conducted by Kyung-Hye, Park. Su Hyun Kang, Hong Joo Lee and Choon Seong Leem analyzed that individual capability factors to improve business performance in the environment of technological convergence. Results showed that it is very important to enhance the communication capabilities with a team member, responsibility and ambidextrous capability about cultural and natural science knowledge.

3. Research Model

Applying text mining techniques using NVivo 10, a research model is designed as followings. Preliminary candidates for industrial convergence competency items are developed and validated by on-site interview and preliminary survey. And to diagnose SMEs’ level of competency, diagnostic tools are developed and survey validation is performed for final model improvement.

4. Development of Preliminary Keyword for Industrial Convergence Competency

Authors collected 73 related documents for the purpose of text mining to identify preliminary keywords for industrial convergence competency. They are government policies, articles, brochures, curriculums and thesis, etc. By using NVivo 10, a professional S/W for text mining, we have come up with about 67,000 basic coding information and decided only 29 documents summarized in the Table 4 are relevant for text mining. Through several stages of coding, we have developed 50 key candidate words for industrial convergence competency model.

Based on Spencer and Spencer model, we designed industrial convergence competency model as basic convergence competency group, convergence leadership competency group, and convergence expert competency group. Through preliminary survey by 20 industrial convergence experts inside KNICC (Korea Industrial Convergence Center), we condensed 50 key words into 24 key words.

Table 3. Definition of competency

| Author                  | Definition                                                                 |
|-------------------------|-----------------------------------------------------------------------------|
| McClelland              | the best predictors of outstanding on-the-job performance were underlying,   |
|                         | enduring personal characteristics.                                          |
| Boyatzis                | the underlying characteristics of a person that lead to or cause effective  |
|                         | and outstanding performance.                                                |
| Dubious                 | Those characteristics–knowledge, skills, mindsets, thought patterns, and the |
|                         | like—that when used whether singularly or in various combinations, result in |
|                         | successful performance.                                                     |
| Spencer and Spencer     | underlying characteristic of an individual that is causally related to criterion |
|                         | referenced effective and/or superior performance in a job or situation.      |

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|                         | referenced effective and/or superior performance in a job or situation.      |
5. Development of Industrial Convergence Competency Model through Survey and Interview

Selected 43 leading convergence companies participated in the Survey to identify the final key words for Industrial Convergence Competency Model. Table 6 shows the statistical data for the validity of convergence categorization.

According to the statistical analysis shown above, 24 key words are condensed into 20 key words. The concept and definition were developed for these key words. Based on these definitions, by conducting face to face in-depth
interview with 3 leading convergence companies, 20 key words were again condensed finally into 13 key words. The final arrangement of each competency is shown in the Table 7 below.

6. Validation of Industrial Convergence Competency Model and the Development of Diagnostic Tools

We developed Industrial Convergence Competency Model using these 13 key words and diagnostic tools were also developed to measure SMEs’ level of Industrial Convergence Competencies. Illustrative example of diagnostic tools is shown in the Table 8 below.

Using SPSS, we conducted association analysis based on the survey and interview data. The result is shown in the following Figure 1. As shown, there is a strong positive correlation between measured industrial convergence competency and evaluated level of industrial convergence meaning that a company with strong level of industrial convergence competency will be evaluated highly on the level of industrial convergence. Thus, authors have found that the developed industrial convergence competency model composed of the 13 key words has a significant level of credibility. It is, however, still required to condense into 10 key words that are beyond our scope of research this time.

Also we conducted association analysis between each competency factor to prove that each factor has an independent value with validity and credibility. The result is shown in the following Table 9. As shown, there is a strong positive correlation between selected competency factors meaning that the selected industrial convergence competency factors are developed appropriately.

7. Application of Industrial Convergence Competency Model in Practice

The Industrial Convergence Competency Model and diagnostic tools can be used in 2 ways. First, it could be used in diagnosing SMEs’ retention level of Industrial Convergence Competency. And secondly, strategy to upgrade the retention level of Industrial Convergence Competency can be developed by applying the model and the tools. For this purpose, based on the score of Industrial Convergence Competency model, the types could be divided into 5 stages and 15 categories as shown in the Table 10 below. According to this specific category or type, we developed basic strategy scenario to upgrade the company’s Industrial Convergence Competency level.

8. Accomplishments and Need for Further Research

The study is the first ever research on the industrial convergence competency using text mining techniques. Also it can be used in real practice to upgrade SMEs’ level of industry convergence competency.

The developed model and the tools are only at a very initial stage of progression. By enlarging the limited survey samples the validation test needs to be executed.
Table 6. Statistical data for the validity of convergence categorization

| Competency Name                                      | N  | Min. Statistics | Max. Statistics | Average Statistics | Standard Error | Variance | Standard Deviation Statistics | Variance Statistics |
|------------------------------------------------------|----|----------------|-----------------|--------------------|----------------|---------|-------------------------------|---------------------|
| Openness                                             | 14 | 3.00           | 5.00            | 4.3571             | .16926         | .63332  | .401                          |                     |
| Integrated Thinking Method                           | 14 | 2.00           | 5.00            | 4.2857             | .24424         | .91387  | .835                          |                     |
| Logical Analytical Thinking Capability                | 14 | 2.00           | 5.00            | 3.7857             | .21429         | .80178  | .643                          |                     |
| Passion and Energy                                   | 14 | 2.00           | 5.00            | 3.6429             | .28913         | 1.08182 | 1.170                         |                     |
| Innovation Creation Capability                       | 14 | 3.00           | 5.00            | 4.0714             | .19511         | .73005  | .533                          |                     |
| Pursuit of Open Innovation                           | 14 | 2.00           | 5.00            | 4.1429             | .23103         | .86444  | .747                          |                     |
| Multi-disciplinary Knowledge Consilience Capability   | 14 | 3.00           | 5.00            | 4.0000             | .18157         | .67937  | .462                          |                     |
| Convergence Opportunity Development Capability        | 14 | 3.00           | 5.00            | 4.0714             | .22149         | .82874  | .687                          |                     |
| Communication Capability                             | 14 | 2.00           | 5.00            | 3.9286             | .24505         | .91687  | .841                          |                     |
| Teamwork and Collaboration Capability                 | 14 | 3.00           | 5.00            | 3.9286             | .22149         | .82874  | .687                          |                     |
| Network Development and Idea Absorption Capability    | 14 | 2.00           | 5.00            | 3.8571             | .25370         | .94926  | .901                          |                     |
| Convergence Leadership                                | 14 | 3.00           | 5.00            | 4.2857             | .19410         | .72627  | .527                          |                     |
| Organizational Creativity                            | 14 | 3.00           | 5.00            | 4.0000             | .18157         | .67937  | .462                          |                     |
| IT Knowledge and Application Capability               | 14 | 3.00           | 5.00            | 4.0714             | .19511         | .73005  | .533                          |                     |
| Value Creation Capability                            | 14 | 3.00           | 5.00            | 4.1429             | .20588         | .77033  | .593                          |                     |
| Technology Convergence Capability                     | 14 | 3.00           | 5.00            | 4.2857             | .19410         | .72627  | .527                          |                     |
| Business Modeling Capability                         | 14 | 3.00           | 5.00            | 4.0000             | .20966         | .78446  | .615                          |                     |
| Research Capability for User Experiences             | 14 | 3.00           | 5.00            | 3.7143             | .19410         | .72627  | .527                          |                     |
| Convergence Design Capability                        | 14 | 2.00           | 5.00            | 3.5714             | .25059         | .93761  | .879                          |                     |
| Convergence Resources Integration Capability          | 14 | 3.00           | 5.00            | 3.9286             | .22149         | .82874  | .687                          |                     |
| Convergence Issue Identification and Resolution Capability | 14 | 3.00           | 5.00            | 4.2143             | .18689         | .69929  | .489                          |                     |
| Convergence Phenomenon Understanding Capability       | 14 | 2.00           | 5.00            | 4.0000             | .23440         | .87706  | .769                          |                     |
| Specific Professional Knowledge                      | 14 | 3.00           | 4.00            | 3.5714             | .13725         | .51355  | .264                          |                     |
| Ambidextrous Capability                              | 14 | 3.00           | 5.00            | 3.5714             | .17271         | .64621  | .418                          |                     |
| Average                                              | 14 | 2.667          | 4.958           | 3.9762             | .21018         | .78641  | .633                          |                     |

Source: “Convergence DNA Innovator”, Korea National Industrial Convergence Center, 2014
**Table 7.** Industrial convergence competency model

| Category Group | Name of Competency | Remark |
|----------------|--------------------|--------|
| Basic Common Competency | Integrated Thinking Method | Logical, Analytical Thinking Capability included. |
| | Ambidextrous Capability | Multi-disciplinary Knowledge Consilience Capability included. |
| | Convergence Opportunity Development Capability | Convergence Phenomenon Understanding Capability included. |
| Convergence Leadership Competency | Pursuit of Open Innovation | Openness included. |
| | Innovation Creation Capability | |
| | Harmonious Organization Leadership | Teamwork, Collaboration, Organizational Creativity included. |
| Convergence Specialty Competency | IT Knowledge and Application Capability | |
| | Industrial Convergence Capability | Considering the limitation of Technology Convergence, name of the competency is changed to include wider perspective. |
| | Convergence Business Modeling Capability | |
| | Convergence Resources Integration Capability | |
| | Integrated Problem Solving Capability | Need to avoid the duplication with Convergence Opportunity Development Capability. |
| | Specific Professional Knowledge | |

Source: “Convergence DNA Innovator”, Korea National Industrial Convergence Center, 2014

**Table 8.** Illustrative example of diagnostic tools of industrial convergence competency model

| Section | Name of Competency | Measurement Factor |
|---------|--------------------|--------------------|
| 1       | Integrated Thinking Method | A. Possesses thinking capability to integrate and connect potential solution for social issues and technological issues. |
|         |                     | B. Possesses capability to respond sensitively to changes in technological and social trend and to analyze strategically. |
|         |                     | C. Possesses intention and belief to integrate and connect his/her special area knowledge with other area knowledge. |
|         |                     | D. Thinking approach to create new value by connecting resources(product or service) owned by organization to other resources is spread out. |
|         |                     | E. Possesses capability to collectively interpret again new social phenomenon converge and to converge required knowledge. |
| 2       | Ambidextrous Capability | A. Can produce creative output by materializing and utilizing special knowledge on more than 2 areas. |
|         |                     | B. Contain universal attainments in the adjacent area or other area in addition to major field of study. |
|         |                     | C. Acquiring special knowledge in more than 2 fields of study, retain capability which connects flexibly these areas in a mutual way. |
|         |                     | D. Put emphasis on convergence of knowledge in various fields such as engineering, liberal arts, sociology, culture and arts, management, design and so on with different perspectives. |
| 3       | Convergence Opportunity Development Capability | A. Can understand well the convergence phenomenon occurring in complex and divergent society in a macroscopic, logical, and analytical thinking approach. |
|         |                     | B. Can identify parts requiring convergence under technological change and social trends with flexibility and positiveness. |
|         |                     | C. Contain intellectual and emotional capability that identifies new problems and senses the lead of convergence by jumping over the wall of existing knowledge technology to solve multiple layered issues. |
| Convergence Competency Factor | Coefficient of correlation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|------------------------------|-----------------------------|---|---|---|---|---|---|---|---|---|----|---|
| 1 IT Knowledge and Application Capability | Coefficient of correlation | 1.000 | . | . | . | . | . | . | . | . | . | . |
| | Significant Probability (2 sided) | . | . | . | . | . | . | . | . | . | . | . |
| 2 Convergence Resources Integration Capability | Coefficient of correlation | 289 | 1.000 | . | . | . | . | . | . | . | . | . |
| | Significant Probability (2 sided) | 337 | . | . | . | . | . | . | . | . | . | . |
| 3 Convergence Opportunity Development Capability | Coefficient of correlation | .678 | .393 | 1.000 | . | . | . | . | . | . | . | . |
| | Significant Probability (2 sided) | .011 | .184 | . | . | . | . | . | . | . | . | . |
| 4 Networking Capability | Coefficient of correlation | .591 | .588 | .631 | 1.000 | . | . | . | . | . | . | . |
| | Significant Probability (2 sided) | .033 | .035 | .021 | . | . | . | . | . | . | . | . |
| 5 Pursuit of Open Innovation | Coefficient of correlation | .241 | .378 | .280 | .673 | 1.000 | . | . | . | . | . | . |
| | Significant Probability (2 sided) | .428 | .202 | .354 | .012 | . | . | . | . | . | . | . |
| 6 Industrial Convergence Capability | Coefficient of correlation | .507 | .669 | .553 | .611 | .346 | 1.000 | . | . | . | . | . |
| | Significant Probability (2 sided) | .077 | .012 | .050 | .026 | .247 | . | . | . | . | . | . |
| 7 Integrated Problem Solving Capability | Coefficient of correlation | .211 | .264 | .353 | .333 | .380 | .570 | 1.000 | . | . | . | . |
| | Significant Probability (2 sided) | .489 | .384 | .237 | .266 | .200 | .042 | . | . | . | . | . |
| 8 Innovation Creation Capability | Coefficient of correlation | .122 | .462 | .305 | .212 | .154 | .366 | .194 | 1.000 | . | . | . |
| | Significant Probability (2 sided) | .692 | .112 | .311 | .487 | .615 | .219 | .525 | . | . | . | . |
| 9 Adjacent knowledge to major field | Coefficient of correlation | .164 | .379 | .088 | .385 | .009 | .227 | .345 | .025 | 1.000 | . | . |
| | Significant Probability (2 sided) | .593 | .202 | .774 | .194 | .978 | .456 | .248 | .935 | . | . | . |
| 10 Ambidextrous Capability | Coefficient of correlation | -.099 | .354 | -.182 | .168 | -.059 | .213 | .387 | .123 | .489 | 1.000 | . |
| | Significant Probability (2 sided) | .747 | .235 | .551 | .583 | .848 | .484 | .192 | .689 | .090 | . | . |
| 11 Evaluation Index of Industrial Convergence | Coefficient of correlation | -.243 | .254 | -.132 | .224 | .332 | .229 | .003 | .488 | .272 | -.086 | 1.000 |
| | Significant Probability (2 sided) | .424 | .403 | .668 | .462 | .267 | .453 | .993 | .091 | .368 | .779 | . |
more thoroughly. Also advancement in upgrading the model and the tools needs to be performed continuously. Finally the training program for SMEs that needs to train their staffs to upgrade their Industrial Convergence Competency Model is required for further development.

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10. References

1. Hacklin F, Raurich V, Marx C. Implications of technological convergence on innovation trajectories: The case of ICT industry. International Journal of Innovation and Technology Management. 2005; 2(3):313–30.
2. Gill T, Lei J. Convergence in the high-technology consumer markets: Not all brands gain equally from adding new functionalities to products. Marketing Letters. 2009 Mar; 20(1):91–103.
3. Dainty ARJ, Cheng MI, Moore DR. A competency based performance model for construction project managers. Construction Management and Economics. 2004; 22(8):877–86.
4. Shippmann JS, et al. The practice of competency modeling. Personnel Psychology. 2000 Sep; 53(3):703–40.
5. Ennis MR. Competency models: A review of the literature and the role of the Employment and Training Administration (ETA). Office of Policy Development and Research. Employment and Training Administration. US Department of Labor. 2008.
6. Park KH. IT convergence new industry competency strengthening factor. The Journal of Digital Policy and Management. 2012; 147–54.
7. Curran CS. The anticipation of converging industries: A concept applied to nutraceuticals and functional foods. Springer Science and Business Media. 2013.
8. Bores C, Saurina C, Torres R. Technological convergence: A strategic perspective. Technovation. 2003 Jan; 23(1):1–13.
9. Hacklin F. Management of convergence in innovation: Strategies and capabilities for value creation beyond blur-

Table 10. Stage types of Industry Convergence Competency Diagnosis

| Level of Industrial Convergence Competency | Level I Initial Stage | Level II Expanding Stage | Level III Established Stage | Level IV Innovative Stage | Level IV Enhancing Stage |
|-------------------------------------------|-----------------------|--------------------------|-----------------------------|---------------------------|--------------------------|
| Basis of Evaluation                       | Score of Industrial Convergence Competency Diagnosis Below 1.5 | Score of Industrial Convergence Competency Diagnosis Between 1.5 and below 2.5 | Score of Industrial Convergence Competency Diagnosis Between 2.5 and below 3.5 | Score of Industrial Convergence Competency Diagnosis Between 3.5 and below 4.5 | Score of Industrial Convergence Competency Diagnosis Over 4.5 |
| Detailed Type                             | Low Basic Common Competency Type (B) | Low Basic Common Competency Type (B) | Low Basic Common Competency Type (B) | Low Basic Common Competency Type (B) | Low Basic Common Competency Type (B) |
|                                           | Low Leadership Competency Type (L) | Low Leadership Competency Type (L) | Low Leadership Competency Type (L) | Low Leadership Competency Type (L) | Low Leadership Competency Type (L) |
|                                           | Low Specialty Competency Type (E) | Low Specialty Competency Type (E) | Low Specialty Competency Type (E) | Low Specialty Competency Type (E) | Low Specialty Competency Type (E) |

Source: “Convergence DNA Innovator”, Korea National Industrial Convergence Center, 2014
ring industry boundaries. Science and Business Media.
2007.
10. Curran CS, Leker J. Patent indicators for monitoring con-
vergence–examples from NFF and ICT. Technological
Forecasting and Social Change. 2011 Feb; 78(2):256–73.
11. Pennings JM, Puranam P. Market convergence and firm
strategy: New directions for theory and research. In ECIS
Conference, the Future of Innovation Studies; Eindhoven,
Netherlands. 2001 Sept.
12. McClelland DC. Testing for competence rather than for
“intelligence”. American Psychologist. 1973 Jan; 28(1):1–14.
13. Boyatzis RE. The competent manager: A model for effective
performance. John Wiley and Sons; 1982.
14. Dubois DD. The competency casebook: Twelve studies in
competency-based performance improvement. Human
Resource Development. 1998.
15. Spencer LM, Spencer SM. Competency at work. New York:
John Wiely and Sons; 1993.
16. Kang SH, Lee HJ, Leem CS. Analysis of individual capa-
ability factors to improve business performance in the
environment of technological convergence. The Journal of
Society for e-Business Studies. 2010; 15(3):183–93.