A Competence Model for Design Managers: *A Case Study of Middle Managers in Korea*

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Design managers are called upon to enhance their competences at various levels within the corporate environment. Accordingly, this study aims to establish a competence model for design managers (CMDM). The CMDM was established through deductive content analysis of pertinent international journal articles. The study further investigates the competences perceived to be important for middle-level design managers through a survey conducted in South Korea. To establish the diverse ways in which middle managers are engaged in the product development process, survey respondents were divided into three different design functions: front-end focused, back-end focused, and intermediate. We found that generic design managers identified strategic and tactical competences to be most important, and operational competence (i.e., design expertise) to have medium importance. Moreover, middle-level design managers required a broad spectrum of competences to understand both top management and actual practice; they demonstrated more tactical and operational competences than generic design managers did. The three design functions represented different patterns of importance: those with a front-end focus exhibited a strategic orientation and a generalist manager's perspective; those with a back-end focus showed a practical orientation and a specialist manager's perspective; and those in the intermediate group demonstrated both types of characteristics. This study also provides a portfolio of exemplary competences for middle-level design managers, segmented by design function.

Keywords **–** Design Managers' Competences, Competence Model, Middle-Level Design Managers, Competence Portfolio

Relevance to Design Practice **–** From a managerial perspective, the findings of this study can help in defining the roles and competences of design managers. In academia, these findings may provide a guideline for developing design management curricula tailored to the requirements of practice.

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Introduction

The more that design is used as a means to gain competitive advantage and as a strategic tool in the corporate environment, the more the roles and responsibilities of designers expand (Borja de Mozota, 2002; Bruder, 2011; Perks, Cooper, & Jones, 2005; Stevens & Moultrie, 2011; von Stamm, 2004). Accordingly, design managers are also called upon to push the boundaries of their activities. Cooper and Press (1995) showed that certain procedural actions in design management (planning, organizing, implementation and monitoring, and evaluation) are carried out across three management levels (the board, middle management, and design activity). Best (2006), Chung (1998), and Lockwood (2010) categorized design management activities as strategic (e.g., corporate design; policy, mission, and agenda; corporate strategy), tactical (e.g., design organization; teams, processes, and systems; process in the business unit), or operational (e.g., design project; tangible product, service, and experience; physical design outcomes). Borja de Mozota (2003) suggested similar levels of design management activities, but incorporated aspects such as strategy, planning, human resource and structure, and communication.

With these diversified levels of design management activities, design managers are taking on an increasingly complex role. Accordingly, their competences have been discussed in design management literature. Briggs, Green, and Lombardi (1998) specified three critical elements for a design manager: design skills, knowledge of human dynamics, and knowledge of basic business practices. Green et al. (2004) and Peters (2012) noted that design managers should have management and negotiation skills, business savvy, understanding of people and processes, and expert knowledge of design. Moreover, some studies investigated the competences of design leaders in particular. Several scholars concurred that design leadership requires such abilities as envisioning the future, directing and nurturing creativity, and strategic thinking (McCullaph, 2008; Turner & Topalian, 2002). Han and Bromilow (2010) categorized various design leadership competences into creative leadership, business awareness, and relationship/communication. Maciver (2012) emphasized that design leadership involves balancing old

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design competences (e.g., functional, design, tangible) with new ones (e.g., strategic, business, intangible). Miller and Moultrie (2013b) proposed the following five categories of skills utilized by design leaders (ordered by importance): design, cognitive, interpersonal, business, and strategic skills.

A review of the previous research on the competences of design managers and leaders raises three issues that should be explicated. First, the relation between design managers and design leaders needs to be clarified; their competences overlap in some studies and are separate in others. This issue is discussed in the following section when laying out the definition and scope of the term "design manager" as used in this study. Second, the term "competence" needs to be clearly defined, as it is used variously to mean activities, tasks, capabilities, skills, and/or knowledge. Third, the necessity of design expertise to design management should be explored, as there is disagreement among scholars regarding whether it is a fundamental competence. The second and third issues are investigated under Theoretical Background.

In design management research, the predominant perspective on the relation between design managers and design leaders has been concerned with the distinction between them (Borja de Mozota, 2003; Cooper & Press, 1995; Topalian, 2011), characterizing design management as reactive and design leadership as proactive (Turner & Topalian, 2002). Recently, however, the interdependence between design managers and design leaders has been argued in statements such as "design management needs design leadership in order to know *where to go* and design leadership needs design management to know *how to get there*" (Joziasse, 2011b, p. 399). Moreover, in a design project, the work scope of design managers and of design leaders largely overlaps (Rajabalinejad & Spitas, 2012), and one individual can "oscillate between design leading and design managing modes" (Miller & Moultrie, 2013a, p. 173). This change in perspective toward the coexistence of design managers and design leaders embraces the concept of "ambidextrous leaders" (Rosing, Frese, & Bausch, 2011) in management research, who flexibly switch modes between management and leadership according to the applicable context.

Thus the roles of the design manager and design leader tend to coincide and share characteristics. This implies that their functions may not be clearly divided according to the levels of management activity (strategic, tactical, or operational) or hierarchies. For example, the design manager of one position could have management and leadership competences at the strategic, tactical, and operational levels, although with varying levels of emphasis based on the individual's position in the management hierarchy. To specify the scope of this study, it is necessary to define the hierarchical levels of design managers.

Middle-Level Design Managers

The term "design manager" represents an extensive range of hierarchical levels, just as the term "manager" does. Generic managers are usually divided into three levels: supervisory managers, middle managers, and top managers (Hellriegel, Jackson, & Slocum, 2005; Spencer & Spencer, 1993). Moreover, Borja de Mozota (2003) and Chung (2010) proposed five levels of design managers according to job titles and responsibilities, and these levels are comparable with those of generic managers (Table 1).

There is a trend in management research toward highlighting the value of middle managers. Middle managers hold a semi-executive position, linking top management and supervisory line management (Dance, 2011). Thus they function as the glue or buffer between top management and lower-level employees (Ryan, 2008). Prior research has focused on the activities and roles of top managers in connection to corporate entrepreneurship, and conventionally middle managers are described as passively implementing top management's strategies among lower-level employees (Kanter, 1986). However, Floyd & Wooldridge (1992, 1994) determined that the role of middle managers is proactive, having both upward influences (e.g., synthesizing information, championing strategic alternatives) and downward influences (e.g., facilitating adaptability, implementing deliberate strategy). Thereafter, many scholars investigated the strategic value and contributions of middle managers, such as promoting corporate entrepreneurship efforts, selling issues to top management, fostering communication, creating effective working

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Table 1. Generic managers vs. design managers by hierarchical level.

<table>
<tr><th colspan="2">Levels of Managers</th><th colspan="2">Levels of Design Managers</th></tr>
<tr><th>Spencer and Spencer (1993)</th><th>Hellriegel et al. (2005)</th><th>Borja de Mozota (2003)</th><th>Chung (2010)</th></tr>
<tr><td rowspan="2">Executive and general manager</td><td rowspan="2">Top manager</td><td>Strategic design manager (CDO, CEO)</td><td rowspan="2">Design executive</td></tr>
<tr><td>Design organization manager
(director, principal)</td></tr>
<tr><td rowspan="2">Middle manager</td><td rowspan="2">Middle manager</td><td>Design staff manager
(creative director, studio designer)</td><td>Project designer</td></tr>
<tr><td>Design project manager
(senior designer, project designer, associate design director)</td><td>Senior designer</td></tr>
<tr><td>Supervisor of professional workers/ supervisor of hourly paid workers</td><td>First-line manager</td><td rowspan="2">Designer
(assistant designer, associate designer, designer)</td><td>Junior designer</td></tr>
<tr><td>Non-manager</td><td>Non-manager</td><td>Entry-level designer</td></tr>
</table>

environments, facilitating change, and ensuring smooth operations (Delmestri & Walgenbach, 2005; Floyd & Wooldridge, 1997, 2000; Huy, 2001, 2002; Metheny, 2013; Wooldridge, Schmid, & Floyd, 2008). The fundamental consensus of those scholars is that middle managers play both management and leadership roles. Furthermore, Dance (2011) showed that middle managers require competences related to strategic, human resource, and technical tasks. Consequently, the competences of middle managers may be spread widely throughout all management levels, comprising both management and leadership functions.

In design management research, however, there has been little focus on middle-level design managers. Several studies underscored the role of design leadership, focusing on top-level design executives (Joziasse, 2011b; McCullaph, 2008; Miller & Moultrie, 2013a), but most studies used the term "design manager" (or "design leader") in a general sense, not clearly distinguishing between top and middle design managers. Moreover, designers often become middle-level design managers later in their career; thus, investigating the competences of middle-level design managers has wide relevance in design management research. In actual practice, the top design executives of a company are generally a minority, with most designers spending a large part of their career at the middle level. Further, while top-level executives are generally expected to require strategy-related competences, the competences of middle-level design managers may be more diverse and representative of all management levels, as has been shown in management research. Thus an in-depth investigation of the competences of middle-level design managers can provide a realistic and valuable contribution to the majority of designers and design managers.

For these reasons, this research focuses on middle-level design managers and the competences required of them. Middle-level design managers may engage in both design management and design leadership, just as generic middle managers do. Therefore, this study first broadly investigates the competences of generic design managers, and then specifically identifies which competences are most important for middle-level design managers. As mentioned earlier, several studies have focused on design managers' competences, and the existing design management literature provides abundant descriptions of design managers' roles, functions, capabilities, skills, and knowledge. Nevertheless, little research has been dedicated to categorizing them and developing a structured competence model for design managers. Therefore this study has three aims: (1) to examine generic competence models as a theoretical foundation; (2) to establish a competence model for generic design managers; and (3) to determine which competences are important for middle-level design managers in Korean professional practice.

The remainder of this paper is organized as follows: First, the theoretical background of competence models is discussed. This is followed by a description of the research design and methodology as well as the results and findings. The last section discusses implications and limitations of the study as well as future research directions.

Theoretical Background: *Competence Models*

As mentioned in the Introduction, the term "competence" is used in various ways, and thus should be clearly defined. The management and human resource development field has taken two distinct approaches to competence research. The person-oriented behavioral approach, common in the United States, uses the term "competency," defining it as the "underlying characteristics of a person" that are "causally related to effective and/or superior performance in a job or situation" (Boyatzis, 1982, p. 21; Spencer & Spencer, 1993, p. 9). On the other hand, the task-oriented functional approach, common in the United Kingdom, uses the term "competence," defining it as "the ability to apply knowledge, understanding and skills in performing to the standards required in employment" (Beaumont, 1996). These two approaches coexisted until the 1990s, when a holistic model integrated them.

Holistic Competence Model (HCM)

After the holistic model of professional competence was suggested by Cheetham and Chivers (1996, 1998), Le Deist and Winterton (2005) proposed a typology of competence that is highly cited in research on human resource development: the holistic competence model (HCM). Here, cognitive competence (CC) is the possession of work-related knowledge and the ability to apply it effectively; functional competence (FC) is the ability to perform work-based tasks effectively; social competence (SC) is relational and communication skills and abilities; and meta-competence (MC) refers to personal and professional values and attitude. These competences comprise knowledge (CC), tasks and activities (FC), skills and abilities (CC, FC, and SC), and values and attitude (MC). The HCM is holistic in that the occupational dimension (CC and FC) corresponds to the task-oriented functional approach, while the personal dimension (SC and MC) relates to the person-oriented behavioral approach. In addition, this model uses the term "competence" rather than "competency." Thus in the present study we also adopt the word "competence" to encompass both the functional and behavioral perspectives.

Because the HCM is a generic framework, its competence categories can encompass design managers' competences. However, the model is limited in its ability to distinguish specific design domains. For example, design knowledge, process knowledge, and business knowledge (Green et al., 2004) would all be categorized as cognitive competences despite being relevant to distinct levels of management activity. Business and strategic skills and design skills would be classified as functional competences, although they represent different levels (Miller & Moultrie, 2013b). Therefore it is necessary to integrate additional criteria: the operational, tactical, and strategic levels of design management activity explained in the Introduction (Best, 2006; Borja de Mozota, 2003; Chung, 1998; Cooper & Press, 1995; Lockwood, 2010). Figure 1 represents a conceptual framework based on the HCM and complemented by three levels of management activity. It also provides example competences, as discussed in the Introduction. None of the previous studies on design manager competences fully explored the four competence categories. Hence this framework (1) provides comprehensive competence categories based on the HCM, and (2) distinguishes specific manager competences in the design domain via the three levels of management activity.

Design Expertise for Design Managers

In this study, the operational level of management activity mainly involves design expertise. There is a debate regarding whether design managers require such expertise, as mentioned in the Introduction. The conventional view holds that design expertise and training are not preconditions for design managers and design leaders (Joziasse, 2011a; McCullaph, 2008; Topalian, 2011; Turner, 2000). However, an emerging perspective posits that design expertise may be a favorable competence for design managers (Perks et al., 2005), as some research has found that managers with design backgrounds show superior performance through hands-on design ability (Lockwood, 2011). Sherwin and Maguire (2010) strongly emphasized that design expertise enables design managers and leaders to fully understand, cooperate with, and direct designers. Miller and Moultrie (2013b) supported this assertion, demonstrating that design skills are essential to design management and leadership.

To clarify this issue, it may be meaningful to explore the competences of technical managers in engineering management, whose specialist expertise is akin to that of design managers. Such professionals may possess expertise that is not easily accessible to their managers (Rueschemeyer, 1986). Hence, "the fundamental control problem faced by technical managers is 'coasting' based on the possession of specialized expertise and the indeterminacy of work activities and outcomes" (Causer & Jones, 1996, p. 108). Consequently, a certain level of technical competence is required to manage technical professionals, and it is "wise to hire managers and supervisors from among technically trained professionals" (Roberts & Biddle, 1994, p. 563). The necessity of expertise for technical managers was also established in studies of information system (IS) managers' competences (Wu, Chen, & Chang, 2007; Wu, Chen, & Lin, 2004). The IS-relevant skills and knowledge (e.g., database management, programming languages, networking and telecommunications, operating systems) are important to IS managers regardless of their hierarchical level.

<table>
<tr><th colspan="2">Cognitive competence</th><th colspan="2">Meta-competence</th></tr>
<tr><td>Strategic level</td><td>Business knowledge (Briggs et al., 1998; Green et al., 2004; Han & Bromilow, 2010)
Envisioning the future, strategic thinking (Turner & Topalian, 2002; McCullaph, 2008)</td><td colspan="2" rowspan="3">Attention to detail (outcome quality), proactive attitude, empathy (Han and Bromilow, 2010)</td></tr>
<tr><td>Tactical level</td><td>Knowledge of human dynamics and process (Briggs et al., 1998; Green et al., 2004)</td></tr>
<tr><td>Operational level</td><td>Expert knowledge of design (Green et al., 2004)</td></tr>
<tr><th colspan="2">Functional competence</th><th colspan="2">Social competence</th></tr>
<tr><td>Strategic level</td><td>New design competences (strategic, business, intangible) (Maciver, 2012)
Business and strategic skills (Miller & Moultrie, 2013b)</td><td>Strategic level</td><td>Directing and nurturing creative design environment (Turner & Topalian, 2002; McCullaph, 2008)</td></tr>
<tr><td>Tactical level</td><td>Management skills (Green et al., 2004)</td><td>Tactical level</td><td>Negotiation skills (Green et al., 2004)
Interpersonal skills (Miller & Moultrie, 2013b)</td></tr>
<tr><td>Operational level</td><td>Design skills (Briggs et al., 1998; Miller & Moultrie, 2013b)
Old design competences (functional, design, tangible) (Maciver, 2012)</td><td>Operational level</td><td>Presentation, communication skills (Han and Bromilow, 2010)</td></tr>
</table>

Figure 1. Conceptual framework of design manager competences modified from the holistic competence model.
Note: The competences from existing research categorized under Meta-competence did not show three levels.

Likewise, it is essential to include the operational level (i.e., design expertise) when investigating the competences of design managers. Furthermore, the conceptual framework that combines the HCM and three levels of management activity, including the operational level, may shed light on domain-specific competences for expertise-based design managers.

Research Design and Methodology

The research process was designed in two phases based on the aims defined in the Introduction: to establish a competence model for generic design managers, and to determine the importance of competences for middle-level design managers in Korean professional practice.

Phase 1. Development of a Competence Model for Design Managers (CMDM)

In the human resource development field, Lucia and Lepsinger (1999) suggested two approaches to developing a competence model. The first is a start-from-scratch approach that involves extensive interviews and observations; the second is a pre-populated literature approach based on validated models. The first approach may be particularly valuable in reflecting characteristics of a specific domain/organization/job, but it requires much in the way of time and resources. The second approach enables the use of an already justified model, minimizing the amounts of time and resources needed, but may be unable to capture the distinctiveness of a particular area. Therefore this study adopts a combination of these approaches: first, it uses the pre-populated HCM as a theoretical background; second, it uses already published results of extensive interviews, observations, and research on design managers in academic papers as an ample source of competence data. The combination of two approaches may be aligned with deductive content analysis (Elo & Kyngäs, 2008), which is often used when applying existing concepts or models in a new context. This methodology starts with developing a categorization frame based on existing theories and then codes the data according to the categories. Accordingly, the conceptual framework of this research (Figure 1) was framed in a cross-table format and prepared as a categorization matrix for deductive content analysis (Figure 2). Meta-competence was not divided into three levels in the conceptual framework. However, during the deductive content analysis, it was so divided in the categorization matrix for probable competence items, in addition to the existing undivided category.

To extract design manager competence data from pertinent research papers, authoritative international journals were selected according to the following criteria: (1) journals that are fully dedicated to the design management field; (2) design journals that clearly include design management in their scope statement; and (3) interdisciplinary journals that actively integrate design in their scope. Based on the first criterion, *Design Management Review* (*DMR*) and *Design Management Journal* (*DMJ*) were selected. The *International Journal of Design* (*IJD*) and *The Design Journal* (*TDJ*) were chosen based on the second criterion. Various well-known journals, such as *Design Studies* and *Design Issues*, were not included because they did not expressly mention design management in their scope statements. Based on the third criterion, *Creativity and Innovation Management* (*CAIM*) and the *Journal of Product Innovation Management* (*JPIM*) were added due to their interest in the integration of design in management. In particular, *CAIM* published a special issue on design management in 2013. In total, six international journals were selected to extract design managers' competence items. International, rather than Korean, journals were selected in order to establish a generalizable competence model. This model aims to represent a broad spectrum of competences that generic design managers may have. This generalized model will enable identification of those competences that are particularly important for Korean middle-level design managers.

As shown in Table 2, we reviewed articles published during the most recent four years (2010–2013). If current trends in the business and design world (e.g., the focus on design thinking in the management field, the popularization of the smartphone, the rapid expansion of the ICT industry, and the shifts from web to mobile and from interface to experience design) have had any influence on the role or competences of design managers, these are likely to be reflected in the CMDM.

The *DMR* and *DMJ* are fully dedicated to design management; thus, all articles were reviewed without screening. The articles in *IJD* and *TDJ* were screened to filter content relevant to design management, with the conditions "manag*," "strateg*," "business," or "professional" in the keywords or abstract of each article. Articles from *CAIM* and *JPIM* were filtered first with "design," as they are not design-focused journals. The retrieved articles were then filtered with the conditions used for the *IJD* and *TDJ* articles. The 280 articles retrieved were thoroughly reviewed to extract competence items from their respective primary messages. Ultimately, 147 articles were chosen as the sources of design manager competences.

Categories	**Strategic level**	**Tactical level**	**Operational level**
Cognitive competence			
Functional competence			
Social competence			
Meta-competence			

Figure 2. Categorization matrix for deductive content analysis based on the conceptual framework.

Table 2. Journals and the number of articles selected for research.

Journal	*# of articles published in the journal (2010–2013)*	*# of reviewed articles relevant to design management*	*# of articles from which design manager competence items were sourced*
Design Management Review (*DMR*)	133	Reviewed all articles without screening	102
Design Management Journal (*DMJ*)	27		20
International Journal of Design (*IJD*)	83	18	7
The Design Journal (*TDJ*)	99	24	5
Creativity and Innovation Management (*CAIM*)	156	20	3
Journal of Product Innovation Management (*JPIM*)	391	58	10
Total	889	280	147

First, the articles from *DMR* and *DMJ* were reviewed. The authors extracted a total of 340 design manager competence items from the 122 articles. Each item was tagged with the sourced article's code number. Subsequently, workshops were held with six design management researchers.[1] In the first round, they were asked (1) to group the items by the affinity diagram method (Beyer & Holtzblatt, 1999; Cohen, 1995) and (2) to classify them according to the categorization matrix. During these processes, the tagged code number of each item was counted accumulatively as the items were grouped. In the second round, the competence items extracted from *IJD*, *TDJ*, *CAIM*, and *JPIM* were provided, and the researchers repeated tasks (1) and (2). The competence items from the four journals confirmed those previously identified from *DMR* and *DMJ* and did not contribute any new items; they changed only the frequency of items. This may imply that the set of competence items is exhaustive, as no new items appeared despite the repetition. In the third round, the researchers were asked to develop the label for each competence group. Through three rounds of researcher workshops, 340 competence items were reduced to 121.

Six professional design managers[2] from diverse areas (one from each of manufacturing, IT manufacturing, telecommunications, IT portal service, user experience [UX] design consultancy, and branding and visual design consultancy, with 13.67 years of experience on average) were invited to an expert workshop in order to refine the draft version of the CMDM. Their task was to review the categorization and labeling, to delete unnecessary items, and to identify any items missing from the draft version. Ultimately, the number of competence items was reduced to 97, and they were classified into 26 competence groups (the details are illustrated in the Appendix). The final model, with 26 competences, is presented in Figure 3 in the Data Analysis and Results section.

Phase 2. Importance of Competences in the CMDM

To enhance the value of the CMDM, it was important to determine the relative importance of the compete nces for middle-level design managers. In the context of this research, the term "importance of competence" refers to how relevant each competence is to design managers in carrying out their duties effectively. The importance of each competence was verified in two ways: (1) based on the results of the content analysis in Phase 1, as a reference for generic design managers and (2) through a quantitative empirical survey of middle-level design managers in Korean practice. A quantitative approach is more appropriate than a qualitative one, as the second phase aims to examine the objective importance of already identified competences in the CMDM. Consequently, the first empirical hypothesis is that the competences for middle-level versus generic design managers will show different patterns of importance.

First, the rate of mention in the CMDM was calculated. The 26 competence groups from Phase 1 had subordinate competence items, and each item was tagged with the code numbers of the sourced articles. Thus the frequency of the sourced article (i.e., the frequency of mentions of each competence item) was counted and summarized by competence group. Finally, the rate of mention was calculated as a percentage over the 147 total articles.

Second, a questionnaire was developed that asked respondents about the importance of the 26 competence groups. Each question asked, "How much do you think the XX competence is important (or necessary) in your team/organization?" An 11-point scale,[3] ranging from "Not at all important (0)" to "Extremely important (10)" was used to sensitively capture design managers' perceptions. In the survey, the "team/organization" was defined as a group of similar functions in a company.

The survey's sample criteria were as follows:

- Those whose job titles corresponded to middle-level design manager (e.g., senior designer, project designer, team director) according to the focus of the empirical study.
- Those who belonged to the in-house design organizations of large Korean corporations. In Korea, large companies usually empower their in-house design groups. Design consultancies were excluded from the sample because they hardly participate in internal strategic decision making (Borja de Mozota, 2003).
- Those corporations that were well recognized as leading in highly developed industry sectors in Korea (including the IT manufacturing, IT service, product manufacturing, and service industries).

The roles and responsibilities of middle managers are usually defined in relation to project management (Blomquist & Müller, 2006; Floyd & Lane, 2000; Kanter, 2004). In the design domain, project management usually falls under the scope of product development, though the product may be a physical object, service, or business unit, depending on the industry. In new product development research, product development activities

are grouped along a spectrum from *front-end focused* to *back-end focused* (Cooper, Edgett, & Kleinschmidt, 2005; Reid & De Brentani, 2004). Front-end activities include strategic planning, identification of needs (e.g., market/user research), product concept generation, business analysis, and system-level design; back-end activities are more technical in nature, embracing detail design and development, testing and validation, and launch (Goffin & Micheli, 2010; Perks et al., 2005; Ulrich & Eppinger, 1995; Zhang, Hu, & Kotabe, 2011).

The design functions in large corporations span the whole product development spectrum, engaging in both front-end and back-end activities. For example, the large Korean corporations targeted for this survey have separate design strategy and planning functions focused on front-end activities (e.g., the design management centers at Samsung Electronics Co. and LG Electronics Co.). At the same time, these companies have practical design functions, usually in product styling or graphic design, carrying out back-end design work (e.g., the creation of tangible and visible design outputs). Furthermore, these corporations commonly have design functions whose activities fall somewhere in the middle of this spectrum, extending toward both ends. For example, the UX design function involves information architecture and user research (i.e., front end) as well as interaction design (i.e., back end) (Unger & Chandler, 2012). This does not mean, however, that the design strategy/planning, UX design, and product styling/graphic design groups participate sequentially in product development projects based on the focus of their activities. Nevertheless, illustrating design functions along this spectrum may reflect the competences required for various design activities, whether front-end focused, back-end focused, or a combination of both (termed "intermediate" in this study). Therefore, the second empirical hypothesis is that the patterns of importance of competences will vary depending on design function.

The sampling method followed a non-probability sampling design, which is useful when the population number is either unknown or cannot be identified (Kumar & Phrommathed, 2005). The abovementioned sample criteria are precise, and the in-house design organizations of major large corporations are not easily accessible by random sampling methods. Therefore, a mixed method of purposive sampling and snowball sampling was adopted. Purposive sampling can be used in quantitative research when seeking predetermined samples that are best positioned for the study (Kumar & Phrommathed, 2005). The respondents selected by purposive sampling were asked to identify other people in the group or organization satisfying the criteria and to forward the questionnaire to them, which is known as snowball sampling. This process continued until the sample size reached more than 30 respondents per group (Hogg, Tanis, & Rao, 1977). The survey questionnaire was developed in a web-page format and delivered online.

In total, 106 design managers responded to the survey: 34 for Group 1, 36 for Group 2, and 36 for Group 3. Detailed profiles of the respondents are presented in Table 3. First, the data were analyzed using all samples, regardless of group, for comparison with the results of the content analysis. Then the data were separated by group to compare the different patterns in the importance of competences. The details of the data analysis and results are presented in the next section.

Data Analysis and Results

The CMDM and the Importance of Competences for Generic Design Managers

The competence model for design managers (CMDM) was established according to the Phase 1 research methods, as shown in Figure 3. A total of 26 competence groups were

Table 3. Profile of respondents to the survey.

		Total		***Group 1. Front-end focused design***		***Group 2. Intermediate design***		***Group 3. Back-end focused design***	
	N	***106***		***34***		***36***		***36***	
Age	Mean	33.30		34.41		31.28		34.28	
	SD	4.41		4.14		3.33		4.98	
Years of professional experience	Mean	8.61		10.59		6.64		8.72	
	SD	3.89		3.69		2.73		4.17	
		N	(%)	*N*	(%)	*N*	(%)	*N*	(%)
Gender	Male	52	49.06	15	44.12	20	55.56	17	47.22
	Female	54	50.94	19	55.88	16	44.44	19	52.78
Years of professional experience (banded)	4–6 years	36	33.96	4	11.76	18	50.00	14	38.89
	7–11 years	47	44.34	17	50.00	16	44.44	14	38.89
	12 years +	23	21.70	13	38.24	2	5.56	8	22.22
Industry	IT manufacturing	46	43.40	14	41.18	22	61.11	10	27.78
	IT service	22	20.75	8	23.53	14	38.89	0	0.00
	Product manufacturing	23	21.70	7	20.59	0	0.00	16	44.44
	Service	15	14.15	5	14.71	0	0.00	10	27.78
	Total	106	100.00	34	100.00	36	100.00	36	100.00

Category \ Level		Strategic level		Tactical level		Operational level	
Cognitive competences	Knowing	**Knowledge of new disciplines** (contextual knowledge; market trends; business/finance; sustainability; IP)	23.13 %	**Knowledge of organization/ basic project management skills**	5.44 %	**Design knowledge** (design language/principles/research; knowledge of professional design practice)	4.76 %
	Understanding	**Understanding market/stakeholders/ system/context/good design criteria**	17.69 %	**Understanding relationships in processes/projects/business**	2.04 %	**Understanding design acumen and aesthetic sense**	4.08 %
	Thinking	**Versatility in analytical and intuitive thinking; Framing; Holistic/connected thinking**	36.05 %	**Facilitating ideas** (idea generation/transfer); **Recognizing and empathizing with other perspectives**	2.72 %	**Translating needs and requirements into creative/innovative ideas**	4.08 %
Functional competences	Conceptual work	**Clarifying vision/design goals & aligning with business strategy; Managing design assets/output**	36.05 %	**Managing design team/project/ process/resources** (resourcing; combining; coordinating)	17.69 %	**Observing users/real context; Interpreting and capturing latent needs** (various user research methodologies, tools)	11.56 %
	Implementational work	**Creating coherent total experience throughout all design touchpoints**	12.93 %	**Visualizing information for effective knowledge sharing/cooperation**	6.80 %	**Implementing design skills & expertise** (visualization; prototyping; design tools)	21.09 %
Social competences	Communication	**Creating/deploying/sharing business/brand story** (vision, goals) **among stakeholders**	6.80 %	**Communicating with all stakeholders/ different disciplines/users**	19.73 %	**Visual communication; Visual storytelling**	2.72 %
	Relationship	**Building/managing strategic relationships with partners**	2.72 %	**Facilitating** (multidisciplinary) **collaboration; Managing relationships** (conflicts; flexible culture; motivation; training)	45.58 %	**Engaging users/stakeholders in design process**	8.16 %
Meta-competences	Attitude/Mind	**Tolerance for uncertainty/complexity; Generalistic perspective**	5.44 %	**Tolerance for tension and conflict; Embracing diversity; Multifunctionality**	2.72 %	**Initiative to improve by iteration; Pursuit of high quality**	6.12 %
		Creativity; Innovation; Challenge; Exploration					6.80 %
		Empathy; Flexibility; Resilience; Persistence					26.53 %

Figure 3. The competence model for design managers (CMDM)**.**

classified according to the categorization matrix. Cognitive competences were subcategorized into knowing, understanding, and thinking; functional competences into conceptual work and implementational work; social competences into communication and relationship; and meta-competences into attitude/mind. These labels were developed during the researcher workshops, as explained previously. The percentage is the rate of mention calculated as the frequency of articles that mention the respective competence over the 147 articles. A mention rate over 10% was considered relatively high. The cognitive and functional competences showed a high rate at the strategic level; the social competences and conceptual work at the tactical level; and the functional competences at the operational level.

The top three competences at the strategic level were thinking (7. Versatility in analytical and intuitive thinking, 36.05%), conceptual work (10. Clarifying vision or design goals and aligning them with business strategy, 36.05%), and knowing (1. Knowledge of new disciplines such as contextual knowledge, market trends, business, and finance, 23.13%). The top three at the tactical level were relationship (8. Facilitating multidisciplinary collaboration and relationship management, 45.58%), communication (17. Communicating with users, experts from different disciplines, or all stakeholders, 19.73%), and conceptual work (11. Management of the design team, project, process, and resources, 17.69%). At the operational level, implementational work (15. Implementing various design skills and expertise for visualization and prototyping, 21.09%), and conceptual work (12. Observation of users and context and interpretation of latent needs utilizing various user research methods and tools, 11.56%) were the top two. Finally, under attitude/mind, empathy, flexibility, resilience, and persistence were frequently mentioned (26.53%) in meta-competences.

The top three among all competences were as follows: First was collaboration and relationship management (45.58%). Spencer and Spencer (1993) ranked teamwork and cooperation third in the competences of generic managers; thus it could be relevant for both general managers and design managers. However, considering the nature of design work, which involves considerable teamwork and collaboration (Das, 2012; Jani & Sawhney, 2012), this competence may be even more significant for design managers. Second was versatility in analytical and intuitive thinking (36.05%). This resonates with Martin's (2009) conception of design thinking as a balance between analysis and intuition. Analytical thinking is considered a characteristic of managers (Spencer & Spencer, 1993), but design managers need to be capable of oscillating between analytical and intuitive thinking. Tied at second was clarification of vision/design goals and their alignment with business strategy (36.05%), which has been emphasized by many scholars as important for strategic-level design (Best, 2006; Borja de Mozota, 2003; Cooper & Press, 1995; Lockwood, 2010).

From the general perspective of design managers, the highest rates of mention were found for cognitive and functional competences at the strategic level, and for social competences at the tactical level. In contrast, the cognitive and functional

competences at the operational level, which could be regarded as design expertise, were ranked lower than those at the strategic and tactical levels; functional–operational competences (12 and 15 in the CMDM) were still considered important. Therefore, the content analysis may suggest that generic design managers place the greatest emphasis on strategic and tactical competences, while assigning medium importance to operational-level design expertise.

Statistical Analysis of the Survey of Middle-Level Design Managers in Korea

To facilitate comparison with the results of the content analysis, a survey of 106 middle-level design managers was conducted to examine perceived importance to middle managers in professional practice. Table 4 shows the results of descriptive statistics and one-way ANOVA. Twenty-six competence variables were identified as significantly different in all groups ($F_{(25, 2730)} = 13.33$, $p < .05$), Group 1 ($F_{(25, 858)} = 3.45$, $p < .05$), Group 2 ($F_{(25, 910)} = 9.60$, $p < .05$), and Group 3 ($F_{(25, 910)} = 8.01$, $p < .05$). A total of 14 competences (more than half) were significantly different among the three groups. Though not all competences showed a significant difference, it can be assumed that different patterns in the importance of competences exist among the three groups.

To understand the general pattern of importance of each design group, the competences were divided between a high- and a low-importance group. The mean value of each competence was compared with the grand mean of the respective group through a paired-samples *T*-test. When the mean value of a competence was greater than the grand mean and the result of the paired-samples

Table 4. Descriptive statistics on the importance of competences and one-way ANOVA results.

Groups / Competence variables	All Groups (N = 106)		Group 1 (N = 34)		Group 2 (N = 36)		Group 3 (N = 36)		Mean comparison among group (1-way ANOVA)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F-Value, df(2, 103)
1 Knowledge–Strategic (K–S)	7.01	2.22	8.62	1.41	6.28	2.21	6.22	2.07	17.21*
2 Knowledge–Tactical (K–T)	7.35	1.93	8.38	1.58	7.03	1.90	6.69	1.91	8.48*
3 Knowledge–Operational (K–O)	8.68	1.65	8.29	1.75	9.11	1.43	8.61	1.69	2.47
4 Understanding–Strategic (U–S)	8.04	1.63	8.50	1.38	8.47	1.25	7.17	1.86	8.94*
5 Understanding–Tactical (U–T)	7.41	1.90	8.09	1.62	7.36	1.93	6.81	1.95	4.24*
6 Understanding–Operational (U–O)	8.27	1.79	7.56	1.99	8.08	1.79	9.14	1.15	9.15*
7 Thinking–Strategic (T–S)	8.40	1.67	9.03	1.19	8.42	1.71	7.78	1.81	5.35*
8 Thinking–Tactical (T–T)	8.40	1.50	8.74	1.42	8.31	1.35	8.17	1.68	1.37
9 Thinking–Operational (T–O)	8.74	1.30	8.76	1.26	8.69	1.45	8.75	1.23	0.03
10 Conceptual Work–Strategic (CW–S)	7.25	1.75	8.26	1.68	6.78	1.61	6.78	1.59	9.70*
11 Conceptual Work–Tactical (CW–T)	7.08	1.95	8.03	1.71	6.47	2.04	6.78	1.76	6.95*
12 Conceptual Work–Operational (CW–O)	7.69	1.74	7.62	2.09	7.72	1.49	7.72	1.67	0.04
13 Implementational Work–Strategic (IW–S)	7.36	1.77	7.82	1.73	7.25	2.08	7.03	1.40	1.89
14 Implementational Work–Tactical (IW–T)	7.73	1.56	7.76	1.58	7.78	1.68	7.64	1.48	0.08
15 Implementational Work–Operational (IW–O)	8.00	1.85	7.38	2.24	8.36	1.55	8.22	1.59	2.96
16 Communication–Strategic (C–S)	6.86	1.94	7.71	1.83	6.08	2.06	6.83	1.59	6.80*
17 Communication–Tactical (C–T)	7.46	1.71	8.24	1.60	7.11	1.80	7.08	1.52	5.54*
18 Communication–Operational (C–O)	7.75	1.72	8.12	1.81	7.53	1.72	7.61	1.63	1.20
19 Relationship–Strategic (R–S)	6.78	2.20	7.88	1.55	5.53	2.54	7.00	1.74	12.48*
20 Relationship–Tactical (R–T)	7.60	1.88	8.29	1.59	7.19	1.98	7.36	1.88	3.64*
21 Relationship–Operational (R–O)	6.42	2.27	6.47	2.45	6.33	2.27	6.44	2.16	0.35
22 Attitude/Mind–Strategic (AM–S)	7.18	1.84	7.85	1.79	6.83	1.87	6.89	1.70	3.55*
23 Attitude/Mind–Tactical (AM–T)	7.65	1.47	8.21	1.04	7.75	1.38	7.03	1.70	6.28*
24 Attitude/Mind–Operational (AM–O)	8.35	1.39	8.26	1.58	8.19	1.53	8.58	1.00	0.80
25 Attitude/Mind–Meta1 (AM–M1)	8.51	1.44	8.68	1.20	8.42	1.34	8.44	1.73	0.34
26 Attitude/Mind–Meta2 (AM–M2)	8.23	1.44	8.53	1.42	8.28	1.39	7.89	1.47	1.80
Total (grand mean)	7.70	1.86	8.12	1.72	7.51	1.97	7.49	1.82	4.85*
Mean comparison in a group (1-way ANOVA) F-Value	$F_{(25, 2730)} = 13.33$*		$F_{(25, 858)} = 3.45$*		$F_{(25, 910)} = 9.60$*		$F_{(25, 910)} = 8.01$*		

Note: * $p < .05$.

T-test was significant, the competence was classified as having high importance. Conversely, a competence whose mean value was significantly lower than the grand mean was categorized as having low importance. If a competence's mean value was not significantly different from the grand mean of the group, it was classified as having medium importance. Table 5 represents the final classification of competence variables into high-, medium-, and low-importance groups.

Table 5. Classifications of competence variables into high-, medium-, and low-importance groups.

Groups / Importance	All Groups		Group 1		Group 2		Group 3	
	Variables	t(105)	Variables	t(33)	Variables	t(35)	Variables	t(35)
High	9. T–O	9.25*	7. T–S	5.33*	3. K–O	6.84*	6. U–O	9.39*
	25. AM–M1	7.19*	9. T–O	3.76*	9. T–O	5.53*	9. T–O	6.97*
	3. K–O	6.96*	25. AM–M1	3.19*	25. AM–M1	5.14*	24. AM–O	5.96*
	8. T–T	6.36*	8. T–T	2.97*	8. T–T	4.56*	3. K–O	5.22*
	7. T–S	5.28*	26. AM–M2	2.12*	4. U–S	4.46*	25. AM–M1	4.21*
	24. AM–O	5.11*			26. AM–M2	4.02*	8. T–T	3.50*
	26. AM–M2	4.60*			15. IW–O	3.55*	15. IW–O	2.73*
	6. U–O	3.47*			7. T–S	3.36*		
	4. U–S	2.47*			24. AM–O	2.98*		
Medium	15. IW–O	1.75	4. U–S	2.01	6. U–O	2.02	26. AM–M2	1.90
	18. C–O	0.33	1. K–S	1.93	23. AM–T	1.22	7. T–S	1.31
	14. IW–T	0.17	2. K–T	0.85	14. IW–T	1.00	12. CW–O	1.00
	12. CW–O	-0.12	20. R–T	0.77	12. CW–O	0.97	14. IW–T	0.75
	23. AM–T	-0.47	10. CW–S	0.72	18. C–O	0.06	18. C–O	0.62
	20. R–T	-0.71	3. K–O	0.72	5. U–T	-0.52	20. R–T	-0.61
	5. U–T	-1.91	24. AM–O	0.62	13. IW–S	-1.05	4. U–S	-1.32
	17. C–T	-1.95	17. C–T	0.54	20. R–T	-1.08		
			23. AM–T	0.44	17. C–T	-1.66		
			18. C–O	-0.05	2. K–T	-1.69		
			5. U–T	-0.17				
			11. CW–T	-0.46				
			22. AM–S	-1.04				
			19. R–S	-1.14				
			13. IW–S	-1.46				
			16. C–S	-1.62				
			14. IW–T	-1.78				
			12. CW–O	-1.98				
Low	2. K–T	-2.12*	6. U–O	-2.06*	22. AM–S	-2.67*	17. C–T	-2.06*
	13. IW–S	-2.82*	15. IW–O	-2.48*	1. K–S	-3.64*	19. R–S	-2.10*
	1. K–S	-3.73*	21. R–O	-4.61*	21. R–O	-3.74*	23. AM–T	-2.27*
	22. AM–S	-3.77*			10. CW–S	-4.06*	5. U–T	-2.56*
	10. CW–S	-3.96*			11. CW–T	-4.10*	13. IW–S	-2.65*
	11. CW–T	-4.47*			19. R–S	-5.70*	2. K–T	-2.97*
	19. R–S	-5.28*			16. C–S	-5.74*	22. AM–S	-3.01*
	16. C–S	-5.87*					11. CW–T	-3.03*
	21. R–O	-7.02*					16. C–S	-3.12*
							10. CW–S	-3.74*
							21. R–O	-3.78*
							1. K–S	-4.54*

Note: * $p < .05$.

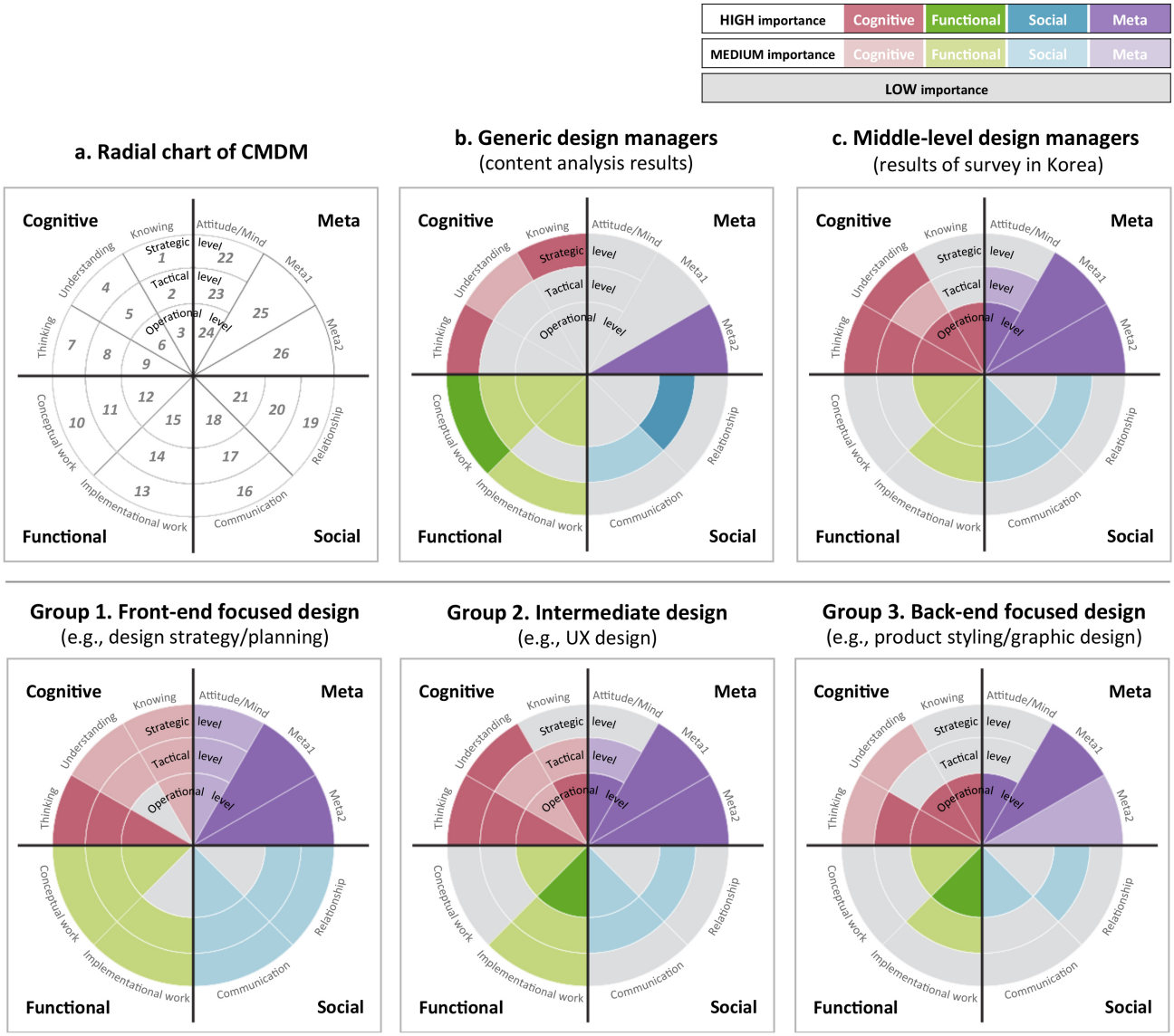

Figure 4. Levels of importance of design managers' competences in radial charts.

Different Patterns in the Importance of Competences

Figure 4 shows radial charts created to illustrate at a glance the three levels of importance of competences (high, medium, and low), four competence categories (cognitive, functional, social, and meta), and three levels of management activity (strategic, tactical, and operational). Figure 4a shows the legend of the CMDM radial chart with each competence number. As shown in the legend of importance in the top-right corner, the high-importance competences are displayed in colors according to competence categories; the medium-importance competences are colored in lighter versions of the same colors; and the low-importance competences are shown in gray. The results from the content analysis are also presented in a radial chart, with a rate of mention greater than 10% indicating medium importance and the top five competences being considered to have high importance. This initial division was necessary in order to compare the overall trends from the content analysis with those from the survey despite the difference in the classification criteria.

Comparison between Generic and Middle-Level Design Managers

The content analysis (Figure 4b) shows that the strategic-level cognitive competences, tactical-level social competences, and most functional competences are of high or medium importance for generic design managers. However, the survey results (Figure 4c) show that most operational-level competences were of either high or medium importance for middle-level design managers. In particular, the cognitive competences at the operational level were highly important; these include design knowledge (3. Knowing–operational), design acumen (6. Understanding–operational), and the translation of needs and requirements into creative ideas (9. Thinking–operational), which could relate to design expertise. These findings imply that middle-level design managers require more operational-level competences than generic design managers do. This might be due to middle managers being more closely involved with lower-level employees and day-to-day activities (Dance, 2011; Kanter, 1986; Ryan, 2008).

Many scholars have noted the strategic role of middle managers (Dance, 2011; Floyd & Wooldridge, 1992, 1994; Huy, 2001; Metheny, 2013). Thus, not surprisingly, the strategic-level understanding and thinking competences (4. Understanding market/stakeholders/business context; 7. Versatility in analytical and intuitive thinking) were identified as highly important for both middle-level and generic design managers. However, cognitive–tactical competences (5. Understanding relationships in processes/projects/business; 8. Facilitating ideas generation and transfer) were highlighted only for middle-level design managers. This is consistent with research demonstrating that middle managers play the role of communicators or mediators (Huy, 2001; Metheny, 2013). In addition, thinking competences at all management levels (7, 8, and 9 in the CMDM) were ranked among the five most important competences. However, generic managers seem to require only the strategic-level thinking competence, whereas middle-level design managers require all thinking competences. In particular, versatility in analytical and intuitive thinking (7. Thinking–strategic) was the only competence ranked in the top five in both the content analysis and the survey results. In addition, meta-competences were found to be more essential for middle-level design managers than for generic design managers.

Comparison of the Different Design Functional Groups

There are many differences in the patterns of importance for the three design functional groups (the bottom three charts in Figure 4). Group 1 gave high or medium importance to most competences except a few at the operational level. It emphasized the strategic and tactical levels, primarily in conceptual work and social competences. Group 2 gave high or medium importance to the operational-level competences throughout the four competence categories (except relationship). In particular, it highlighted design knowledge (3. Knowing–operational), implementation of design skills and expertise (15. Implementational work–operational), and pursuit of high quality (24. Attitude/Mind–operational). Group 3's results were similar to those of Group 2 but more concentrated at the operational level.

A Venn diagram (Figure 5) was created to illustrate how the important competences overlap across the three design functional groups. The competences were numbered according to the CMDM (Figures 3 and 4) and color-coded to reflect the management levels; an extra color was introduced for the meta-level because meta-competences (25 and 26 in the CMDM) have no management levels.

Group 1 needed more competences at the strategic and tactical levels than did Groups 2 and 3: (1) knowledge of new disciplines such as contextual knowledge, market trends, business, and finance; (10) clarifying vision or design goals and aligning them with business strategy; (11) managing design team, project, process, and resources; (16) creating and sharing business or vision story among internal/external stakeholders; (19) building and managing strategic relationships with partners; and (22) tolerance for uncertainty and complexity of design problems. Group 1's results were consistent with those of the content analysis of generic design managers, which implies that the competences important for Group 1 included those of managerial and strategic capabilities.

The important competences for Group 3 were completely contained within the scope of those of Group 2. Further, Group 2 required more strategic and tactical competences than did Group 3: (2) knowledge of organization and project management skills; (5) understanding relationships in process and projects; (13) creating coherent total experience in all design touch points; (17) communicating with users, experts from different disciplines, or all stakeholders; and (23) tolerance for tension and conflict. Thus the scope of important competences in Group 3 seemed to be narrower than in Group 1 or 2. However, Group 3 showed the highest mean values of importance for operational-level competences (Table 4), which implies that Group 3 requires an intensive level of design expertise.

Overall, Group 1 (front-end focused: design strategy/planning) needed more strategic or tactical competences, representing a strong strategic orientation, as shown in Figure 5. Likewise, Group 3 (back-end focused: product styling/graphic design) needed more practice-level competences, demonstrating a strong

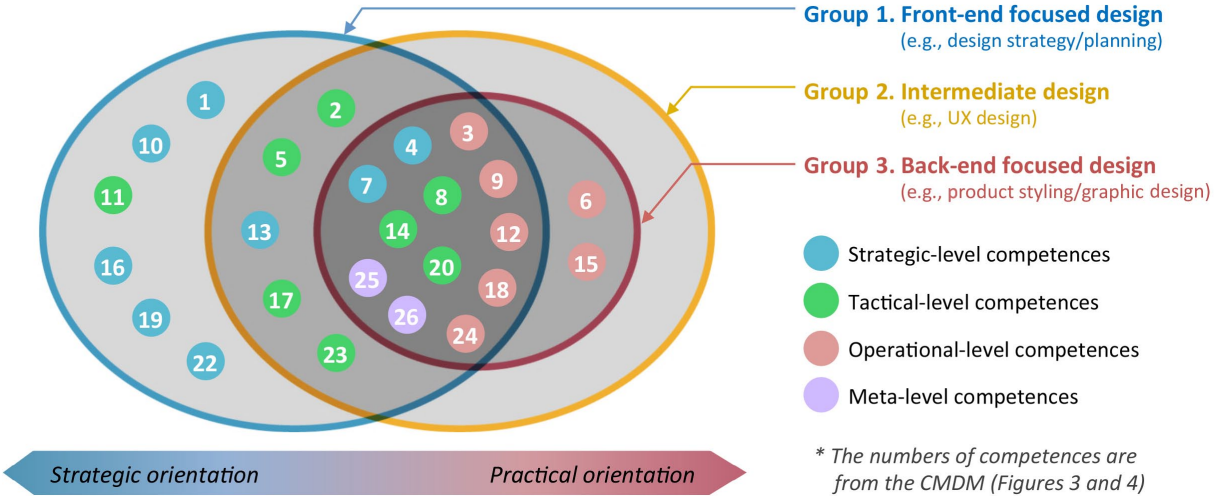

Figure 5. Comparison of management competence levels among design groups.

practical orientation. Group 2 (intermediate: UX design) needed the same practical competences as Group 3 but required additional strategic and tactical competences. The findings suggest that the competences of design functional groups may exist on a spectrum from strategic to practical; a certain position within the spectrum could indicate a particular set of competences for middle-level design managers in their respective design functions.

Major Findings and Contributions

This study aimed to investigate the competences that are important for middle-level design managers, particularly examining two empirical hypotheses: (1) the competences for middle-level versus generic design managers will show different patterns of importance; and (2) the patterns of importance of competences will vary depending on design function. Consequently, the major findings of the research can be summarized into three key points:

First, the content analysis results of the CMDM represented the perspective of generic design managers. The top three most important competences were (1) collaboration and relationship management, (2) versatility in analytical and intuitive thinking, and (3) clarification of vision/design goals and their alignment with business strategy. Hence, for generic design managers, the strategic and tactical competences were emphasized most, supporting the conventional perspective. Further, functional–operational competences, namely design expertise, were found to have medium importance for generic design managers. This may validate the notion that design managers need design expertise, which has been proposed in recent studies.

Second, the survey results illustrated the perspective of middle-level design managers in Korea. They required more operational-level competences than generic design managers did. However, both generic and middle-level design managers showed a strong emphasis on the strategic-level understanding and thinking competences. Unlike generic design managers, middle-level design managers needed cognitive–tactical competences, all levels of thinking competences, and meta-competences. These findings imply that middle-level design managers may require a broad spectrum of competences, especially cognitive and meta-competences, as they need to understand both top management and actual practice in order to facilitate both upward and downward communication.

Third, the patterns in the importance of competences were found to be different according to the three design functional groups. Middle-level design managers with a back-end focus within the product development spectrum (e.g., product styling/graphic design) placed greater priority on operational-level design expertise, consistent with Peters' (2012) "specialist design manager." Meanwhile, those with a front-end focus (e.g., design strategy/planning) required more diverse competences at the strategic and tactical levels, with lower priority on design expertise, consistent with Peters' (2012) "generalist design manager." Those with an intermediate focus (e.g., UX design) required strategic and tactical competences in addition to all of the competences needed by those with a back-end focus. These three functions can be positioned according to their levels of strategic or practical orientation. This suggests that such a spectrum could help determine the particular set of competences needed for middle-level design managers in a given design function.

Accordingly, this research makes three unique contributions to design management research. First, it establishes a competence model for design managers (CMDM) based on the broadly accepted holistic competence model (i.e., cognitive, functional, social, and meta-competences) and systematically structured according to the three levels of management activity (strategic, tactical, and operational). Second, a comparison is provided of the important competences of generic design managers (from the content analysis) versus middle-level design managers (from the survey), with a special focus on delineating the competences of middle-level design managers. Third, this study identifies the importance of competences in different design functional groups. This may be particularly valuable because the functional groups can be extended to design disciplines, and may offer diverse research directions for exploring the competences actually required in various design disciplines.

Conclusions

In conclusion, this research focused on the value of middle-level design managers and their important competences. The competences of generic design managers were broadly investigated and a competence model for design managers (CMDM) was established. Based on this model, the important competences for middle-level design managers were identified and compared with those for generic design managers from the existing literature. Middle-level design managers required a broad spectrum of competences to understand both top management and actual practice, and they demonstrated more tactical and operational competences than generic design managers did. Meanwhile, the important competences exhibited different patterns by design function according to diverse engagement in the product development process. The front-end focused group (e.g., design strategy/planning) presented a strategic orientation and a generalist manager's perspective; the back-end focus group (e.g., product styling/graphic design) demonstrated a practical orientation and a specialist manager's perspective; and the intermediate group (e.g., UX design) showed both types of characteristics.

Implications

The findings of this study can be used to develop a set of important competences for middle-level design managers organized according to design function. Figure 6 demonstrates an exemplary competence portfolio consisting of the top 10 competences for each group.

Implications for Current and Future Design Managers

This kind of competence portfolio based on the CMDM may have important implications for current and future design managers. First, for current middle-level design managers, the competence

Rank	Strategically oriented design (e.g., design strategy/planning)	Intermediate design (e.g., UX design)	Practically oriented design (e.g., product styling/graphic design)
1	7. Versatility in analytical and intuitive thinking; Framing; Holistic/connected thinking	3. Design knowledge (design language/principles/research)	6. Understanding design acumen and aesthetic sense
2	9. Translating needs and requirements into creative/innovative ideas	9. Translating needs and requirements into creative/innovative ideas	9. Translating needs and requirements into creative/innovative ideas
3	25. Creativity; Innovation; Challenge; Exploration	25. Creativity; Innovation; Challenge; Exploration	24. Initiative to improve by iteration; Pursuit of high quality
4	8. Facilitating ideas generation/idea transfer; Recognizing/empathizing with other perspectives	8. Facilitating ideas generation/ idea transfer; Recognizing/empathizing with other perspectives	3. Design knowledge (design language/principles/research)
5	26. Empathy; Flexibility; Resilience; Persistence	4. Understanding market/stakeholders/ system/context/good design criteria	25. Creativity; Innovation; Challenge; Exploration
6	4. Understanding market/stakeholders/ system/context/good design criteria	26. Empathy; Flexibility; Resilience; Persistence	8. Facilitating ideas generation/idea transfer; Recognizing/empathizing with other perspectives
7	1. Knowledge of new disciplines (contextual knowledge; market trends; business/finance)	15. Implementing design skills & expertise (visualization; prototyping; design tools)	15. Implementing design skills & expertise (visualization; prototyping; design tools)
8	2. Knowledge of organization/ basic project management skills	7. Versatility in analytical and intuitive thinking; Framing; Holistic/connected thinking	26. Empathy; Flexibility; Resilience; Persistence
9	20. Facilitating (multidisciplinary) collaboration; Managing relationships (conflicts; motivation)	24. Initiative to improve by iteration; Pursuit of high quality	7. Versatility in analytical and intuitive thinking; Framing; Holistic/connected thinking
10	10. Clarifying vision/design goals & aligning with business strategy; Managing design assets/output	6. Understanding design acumen and aesthetic sense	12. Observing users/real context; Interpreting and capturing latent needs (various user research tools)

Strategic-level competences Tactical-level competences Operational-level competences Meta-level competences

Figure 6. Exemplary competence portfolio of middle-level design managers by design function.

portfolio can be used as a competence evaluation sheet. Initially, it is necessary to determine where one's design function is positioned (strategic, practical, or intermediate). Even in the same product design organization, for example, one individual's function may be more strategically or practically oriented than another's. Based on one's functional position on the spectrum, a set of important competences can be identified from the competence portfolio. Individuals can explore the competences necessary for their current position—which ones they already possess, and which need to be cultivated.

Second, for future middle-level design managers, namely current designers, the competence portfolio can be used as a career path guide. Based on their functional position, individuals can anticipate which competences to cultivate in order to succeed as a middle manager. Moreover, one can decide whether a career as a specialist or a generalist design manager would be more suitable based on the competences needed for each. Even for non-designers, a career as a generalist design manager in design strategy/planning may be advisable given the relatively low importance of operational competences needed for this role.

Third, for top-level design managers, the competence portfolio and the CMDM can be used as a human resource management guide: when defining design managers' competences and roles according to functions or management levels; when assigning an appropriate middle-level design manager to a certain position according to that person's competences; and when establishing competence development programs, such as on-the-job or off-the-job training, appropriate for the middle-level design manager's disciplines and functions.

Implications for Design Schools

From the perspective of design academia, the CMDM and derived competence portfolio could guide decisions about what to include in a design or design management education curriculum. Professional design practice expects that design schools cultivate students appropriately—to work in design practice in the short term and to grow into competent design managers over the long term. Therefore, the content of design education could be geared toward developing pertinent sets of competences according to the strategic–practical orientation of specific design disciplines. Moreover, it would be valuable for design management curricula to globally reflect the competences most important for generic design managers. In addition, the circumstances of and approaches to education should be considered, as the competences can be developed through not only curricula but also diverse learning environments (e.g., multidisciplinary team projects to cultivate the collaboration and relationship management competence).

Limitations and Further Research

The findings of this research may have limitations within the confines of empirical studies. First, the empirical research was focused on middle-level design managers. However, because the CMDM was established based on the perspectives of generic design managers, it can be used in future studies to examine the competences most important for top-level or supervisory-level design managers and to draw comparisons with middle managers. Second, the survey samples were confined to those employed by the in-house design organizations of Korean corporations leading

particular industry sectors. However, because the CMDM is generalizable, having been derived from various international journal articles, future studies could extend their samples to include design consultancies, other countries, or other industries. Third, the representative design functions were selected as design strategy/planning in the front-end focused group, UX design in the intermediate group, and product styling/graphic design in the back-end focused group. However, within this spectrum, there may exist various positions representing other design domains. Thus, the current findings may have limited generalizability to other design fields. Accordingly, further studies might investigate other design disciplines. Fourth, in the survey, design managers were not segmented based on whether they had a design background. Hence, although the results may reflect the current composition of middle-level design managers, they do not explicitly demonstrate how many have a design background. Therefore, the comparison of important competences between design managers with and without a design background could be taken up in further research. Lastly, the reasons behind the diverse patterns of importance of competences were not qualitatively investigated; further qualitative study could investigate the reasons for these different patterns.

Endnotes

1. The six researchers who participated in the workshops included two PhD candidates (one is now a research professor at KAIST) and four Master's candidates, all from the design management lab of the same university. The workshop tasks were primarily grouping, categorizing, and labeling of the already prepared items. The participants had much experience with these kinds of tasks, and they had a sufficient understanding of design management terms.
2. The purpose of the expert workshop was to refine the draft version of the CMDM from the general perspective of professional design practice. Therefore, the six professional design managers were selected from diverse industry areas, and from both in-house design and design consultancy. Four were in-house design managers at major Korean companies widely acknowledged to embrace design as a strategic competence: one each from manufacturing (11 years of experience, manager), IT manufacturing (10 years, manager), telecommunications (16 years, team manager), and IT portal service (10 years, manager). Two were from design consultancies: one from a UX design consultancy (16 years, CEO), and one from a branding and visual design consultancy (19 years, design director).
3. Several scholars in social studies have recently recommended an 11-point (0 to 10) scale, as it improved scale sensitivity, normality, and understandability (Hodge & Gillespie, 2007; Leung, 2011). Miller and Moultrie (2013b) also applied an 11-point scale to rate the level of a design leader's skills at a fine level of granularity. Therefore, for this survey we adopted such a scale in order to sensitively capture the perceptions of design managers regarding levels of importance.

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Appendix

Appendix. Details of 97 competence items and their categorization into 26 competence groups.

Category		Strategic level		Tactical level		Operational level	
		Competence item	*Freq.*	*Competence item*	*Freq.*	*Competence item*	*Freq.*
Cognitive competences	Knowing	**Knowledge of new disciplines** (contextual knowledge (PEST), market trends, business, finance, sustainability, IP)	34	**Knowledge of organization/basic project management skills**	8	**Design knowledge** (design language/principles/research, knowledge of professional design practice)	7
		Contextual knowledge (social, cultural, technological, economic, political, trend)	13	**Knowledge of organizational structure**	5	**Knowledge of design language, design briefing, design research**	2
		Knowledge of business language/terms (M/S, P&L, ROI, marketing/financial terms)	12	**Basic management skills to organize projects**	3	**Knowledge of Interactions, interfaces, product, visual design etc.**	2
		Knowledge of environmental issues (sustainability), **legal issues, social responsibility**	6			**Knowledge of materials, shapes, and forms**	1
		Knowledge of innovation methodologies	2			**Knowledge of typography, aesthetics, composition** (design principles)	1
		Knowledge of intellectual property rights (design patent, trade dress)	1			**Knowledge of design trends**	1
	Understanding	**Understanding market/stakeholders/systems/ context/good design criteria**	26	**Understanding the relationships in processes/ projects/business**	3	**Understanding design acumen and aesthetic sense**	6
		Understanding stakeholders' needs, behaviors, connections, dynamics	10	**Understanding the relationships in cooperation, participation**	1	**Styling expertise, design acumen**	4
		Understanding the interaction/relationships between the business/system and customers	6	**Understanding corporate politics**	1	**Aesthetic sense**	2
		Understanding user context (culture, situation, mood, etc.)	4	**Understanding practical business/management knowhow**	1		
		Understanding market factors and market needs	4				
		Understanding good design criteria (innovative, functional, durable, environmental, aesthetic, user-oriented, consistent with brand, profitable...)	2				
	Thinking	**Versatility in analytical and intuitive thinking; Framing; Holistic/connected thinking**	53	**Facilitating ideas** (idea generation/transfer); **Recognizing and empathizing with other perspectives**	4	**Translating needs and requirements into creative/innovative ideas**	14
		Insight, Intuition (identifying opportunities, underlying challenges, big picture, foresight)	12	**Facilitating ideas**	3	**Creative idea generation**	10
		Balancing between analytical and intuitive thinking (convergent & divergent thinking, company-centered & human-centered thinking)	11	**Recognizing and empathizing with other frames**	1	**Translating user behaviors, requirements into design language**	4
		Integrative thinking, Synthesis (considering holistic gestalt of total)	7				
		Analysis, systematic reasoning	6				
		Framing (distilling complex issues down to a few critical variables)	4				
		Connected thinking (bridging between different knowledge, disciplines)	4				
		Problem definition amid complexity	4				
		Pattern finding	3				
		Using constraints and limitations as a spur to innovation	2				
Functional competences	Conceptual work	**Clarifying vision/design goals & aligning with business strategy; Managing design assets/outputs**	53	**Managing design team/project/process/resources** (resourcing; combining; coordinating)	26	**Observing users/real context; Interpreting and capturing latent needs** (various user research methodologies, tools)	17
		Aligning design/project goals and business objectives/strategy	15	**Settling and managing process** (budget, schedule, deliverables, arrangement of resources)	10	**Facilitating with the tools to capture customers' latent needs** (customer ethnography, etc.)	7
		Managing strategically design equity (e.g. corporate/brand identity, design portfolio)	13	**Managing the right combination of talent and manpower** (in-house/outsourced)	9	**Observation to gain latent/local needs** (problems, target users, context)	7
		Envisioning; Clarifying/consistent seeking of the vision, setting goals	12	**Disciplined approach with design processes, tools, and information management**	4	**Considering the service delivery and embodiment in organization**	2
		Design output management (design evaluation, monitoring design indicators)	6	**Planning and organizing people, infrastructure, communication inside/across organizations**	2	**Profiling users**	1
		Analyzing business positions (market position, competition, industry, stakeholders, risk)	4	**Defining responsibilities** (clarify issues, agree on deliverables, prioritize actions, develop a strategy of collaboration)	1		
		Concentrating resources to the core brand equity	2				
		Adapting objectives, strategies, and technologies according to user understanding	1				
	Implementational work	**Creating coherent total experience throughout all design touchpoints**	19	**Visualizing information for effective knowledge sharing/cooperation**	10	**Implementing design skills & expertise** (visualization; prototyping; design tools)	31
		Creating total experience (product + service)	12	**Visualizing information for communication and knowledge sharing**	7	**Early/rapid prototyping & evaluation**	14
		Rapid contextualization/exploration for business feasibility	4	**Using prototypes to facilitate thinking**	3	**Visualization of the intangible** (activities, interactions, offerings, deliverables)	10
		Visualizing possible futures and vision	3			**Translating user needs/technologies into tangible products/services**	4
						Ability to utilize design tools and technologies	3

Appendix. Details of 97 competence items and their categorization into 26 competence groups (continued).

Category		Strategic level		Tactical level		Operational level	
		Competence item	*Freq.*	*Competence item*	*Freq.*	*Competence item*	*Freq.*
Social competences	Communication	**Creating/deploying/sharing business/brand story** (vision, goals, good design) **among stakeholders**	*10*	**Communicating with all stakeholders/different disciplines/users**	*29*	**Visual communication; Visual storytelling**	*4*
		Creating/deploying brand/business story (story-planning)	*7*	**Building shared knowledge/understanding among stakeholders**	*10*	**Visual communication, Visual storytelling** (storyboard, persona, journey map, digital animation, simulation, role-play, etc.)	*4*
		Sharing the common design perspective (e.g. good design) among internal/external stakeholders	*3*	**Two-way communication with customers (using social media, etc.)**	*8*		
				Storifying, visualizing to communicate with internal/external stakeholders (shared language)	*8*		
				Cross-silo communication	*3*		
	Relationship	**Building/managing strategic relationships with partners/stakeholders**	*4*	**Facilitating** (multidisciplinary) **collaboration, Managing relationships** (conflicts; flexible culture; motivation; training)	*67*	**Engaging users/stakeholders in design process**	*12*
		Building/managing strategic relationships with clients/partners	*4*	**Building/managing relationship with internal/external stakeholders**	*18*	**Engaging users/stakeholders in the design process** (early interaction with prototypes)	*12*
				Facilitating/managing collaboration process	*18*		
				Working in multidisciplinary collaboration	*14*		
				Creating open/flexible group culture, team cohesion	*9*		
				Managing internal team relationships (motivating individual designers, rewarding, empowerment)	*8*		
Meta-competences	Attitude/Mind	**Tolerance for uncertainty/complexity; Generalistic perspective**	*8*	**Tolerance for tension and conflict; Embracing diversity; Multifunctionality**	*4*	**Initiative to improve by iteration; Pursuit of high quality**	*9*
		Tolerance for uncertainty/complexity	*6*	**Tolerance/comfort with tension and conflict**	*1*	**Initiative to improve by iteration**	*4*
		Generalistic/broad perspective	*2*	**Embracing diversity**	*1*	**Putting into action**	*2*
				Being flexible with plan/process	*1*	**Pursuit of high quality**	*2*
				Multifunctionality (hybrid designer-marketer, bridging polarity)	*1*	**Experimentalism**	*1*
				Creativity; Innovation; Challenge; Exploration	*10*		
				Creativity, Innovation	*6*		
				Abstraction	*1*		
				Challenging, Rethinking, Rebuilding	*1*		
				Exploratory procedure	*1*		
				Reflection	*1*		
				Empathy; Flexibility; Resilience; Persistence	*39*		
				Empathy, Human-centeredness	*12*		
				Open-mindedness/Flexibility	*7*		
				Resilience to failure	*4*		
				Belief/persistence to be possible	*4*		
				Optimism/Enjoying	*4*		
				Agile mindset/Adaptability	*3*		
				Curiosity	*3*		
				Responsibility (for speech, social role, thought, ethics)	*2*		

Note. Freq. (frequency) columns show the frequency of mentions of each competence item among the 147 articles.