Design Management Knowledge: Identifying Learning Objectives of Various Stakeholders for Needs-Driven Learning

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Design-management knowledge is of a cross-functional and multidisciplinary nature. Since the stakeholders’ realms of activities as well as their background are diverse, it is expected that their needs for knowledge-learning will also be diverse. In this context, this paper addresses a new way of learning design management knowledge. Content analysis about the learning of design-management stakeholders was conducted to identify learning objectives that can be used for developing learning approaches. The major findings of the research include: 1) 21 learning objectives with different learners in academia, business are identified; 2) understanding other fields, research, innovation, team communication, and strategic use of design were found to be the main goal in design management knowledge learning; and 3) a design criteria for needs-based learning platform was established.

keywords: design-management knowledge; learning objective; needs-based learning

Introduction

Design has been recognized to create a demand that has not yet been discovered, and it is being used in various ways throughout an enterprise's management beyond designing a product or service that meets user needs. Design management can be defined as a set of organizational management activities that are required to achieve the design process (Gorb & Dumas, 1987; Jevnaker, 2000; Joziasse, 2000).
The design process is a multifunctional process that integrates constraints from research and development, marketing, manufacturing, industrial design, and engineering design. The stakeholders of the process have knowledge and background in other fields, so that the design process has multidisciplinary characteristics. In addition, it is important for design management to include and link together other specializations, including areas such as design, marketing, engineering, and strategy. Design-management knowledge is being shared by design-management stakeholders from various specialized fields (O’Grady, 2012; Martin, 2009).

However, what can be useful design management knowledge may differ depending on the situation of various stakeholders. Designers, for example, have become more involved with unfamiliar business indicators and models, so the emphasis is on their ability to share their sense of business and knowledge (O’Grady, 2012). Understanding the relationship between design and business issues is accepted as a way to engage the project as a whole. Likewise in the field of management, design thinking has been applied towards understanding the mind-sets of designers. Design is not only confined to the domain of design itself, but it is accepted as a mature capability of a company that can practice the various ways of thinking that designers use to solve problems (Gardien & Gilsing, 2013).

A variety of design-management stakeholders have been trained and acquired knowledge in a single field of expertise. The different stakeholders of design management are engaged in various design management activities in the enterprise, so it may be pointless for them to acquire the knowledge of design management in a single way. Since the stakeholders’ realms of activities as well as their backgrounds are diverse, it is expected that their needs for knowledge-learning will also be diverse. Therefore, it is necessary to take needs-based approaches to learning in design management to meet the very different needs of various stakeholders.

Ultimately, it may be necessary to design a learning platform that caters to the different needs of the stakeholders of design management. As a first step towards designing such a platform, this study attempts to identify why the various stakeholders of design management want to learn design management knowledge. It is expected that understanding the learning objectives of the stakeholders will contribute towards establishing appropriate design criteria for the needs-driven knowledge-learning platform, which will be the subsequent step in a series of research towards designing the platform. A user-oriented design process can be used to provide a better appreciation of the challenge and a heightened sense of the range of possibilities for the new design management knowledge learning platform to be developed (Kim et al., 2016).

The research aims are:

- To establish impetus for understanding learning objectives of design management knowledge in view of needs-based learning;
- To establish a definition and scope of design-management knowledge; and
- To identify and structuralize learning objectives of various stakeholders for design management knowledge.

The research methodology includes a literature review and content analysis. The knowledge of design management is seldom dealt with in research. Thus, as a first step to
addressing design management knowledge, the definition and scope of design management knowledge are established from literature by firstly defining design management and contrasting design-management knowledge from design knowledge. Following the literature review in the fields of design, design management, and educational psychology, the research establishes the impetus for understanding learning objectives for design management knowledge in view of needs-based learning, ascertaining why learning objectives are important in designing a needs-driven learning platform.

Subsequently, learning objectives are extracted through content analysis on design management literature. The contents of the learning conditions of the design management stakeholders were collected using the verbs indicating learning. Finally, 21 learning objectives were analysed through the affinity diagram method.

The paper is divided into three sections. The first section presents a theoretical underpinning on design management knowledge and the importance of learner needs in knowledge learning. The second section identifies learning objectives and structure of learning objectives that could be ultimately used for designing needs-driven knowledge-learning platform. The third section presents the conclusions of this paper and recommendations for further study.

Design-Management Knowledge and Learning Objectives

Definition and Scope of Design-Management Knowledge

It is necessary to define what design management knowledge is before investigating the learning of it. Since there is no literature that expressly addresses the definition and scope of design-management knowledge, the research attempts to arrive at them by triangulating the definition of design management, the knowledge from the discipline, and the design knowledge.

The term design management emerged in the United Kingdom and the United States in the 1950s and has begun to be established as an academic field. Borja de Mozota (2003) defined design as not only a tangible dimension of the design paradigm but also an intangible dimension as an internal part of the management paradigm and enterprise process. She defined design management as design being integrated within a corporate organization to help a company’s developmental strategy in an operational, functional, and strategic levels.

Best (2006) defined design as an output or user-centred problem-solving process as products, services, interiors, buildings, and software processes and activities facing everyday life. In contrast, she defined design management as ‘to understand the role of design in achieving organizational strategic goals, and to develop the passions and aspirations, the conditions and tools necessary for planning and methods, and means to effectively put them in relevant position’.

McBride (2007) defined design management as the management of creative assets within a company to achieve strategic and sustainable strengths. In addition, design management provides support for processes that focus on value propositions used for the same
Purpose from Design Management Institute. Examples of major definitions of design and design management are presented in Table 1.

**Table 1  Definition of design and design management**

<table>
<thead>
<tr>
<th>Source</th>
<th>Definition of design</th>
<th>Definition of Design Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borja de Mozo (2003)</td>
<td>Creative activity whose aim is to establish the multifaceted qualities of objects, processes, services, and their systems in whole life cycle</td>
<td>Managing the integration of design in the corporate structure at the operational level (the project), the organizational level (the department), and the strategic level (the mission) Managing the design system within the company</td>
</tr>
<tr>
<td>Best (2006)</td>
<td>The outcome of a design project can be seen in the products, services, interiors, building and software processes that we come into contact with daily The activity of designing: user-centered, problem-solving process</td>
<td>The effective deployment by line managers of the design resource available to the organization in the pursuance of its corporate objectives The organization of the processes for developing new products and services</td>
</tr>
<tr>
<td>McBride (2007)</td>
<td></td>
<td>Identification and allocation of creative assets within an organization to create strategic, sustainable advantage</td>
</tr>
<tr>
<td>Design Management Institute</td>
<td>Design management encompasses the ongoing processes, business decisions, and strategies that enable innovation and create effectively-designed products, services, communications, environments, and brands that enhance our quality of life and provide organizational success.</td>
<td></td>
</tr>
</tbody>
</table>
The key points extracted from literature regarding design-management knowledge are as follows:

- **Organization**: Knowledge on the integration of design within a corporate organization that can help a company develop strategies at the project, departmental or headquarters levels, or strategic level;
- **Vision and strategy**: Knowledge on the establishment and implementation of vision and design strategy to meet organizational strategy;
- **Process**: Knowledge on the processes that achieve innovations for new environments and new user experiences within the company;
- **Environment**: Knowledge on the development of a creative work environment for design; and
- **Designer resource management**: Knowledge on the deployment of the design resource available to the organization.

Therefore, design-management knowledge is defined as ‘the knowledge related to design-related organizational issues, design vision and strategy, processes and environments for design, and designer resource management’ for the purpose of the research.

Design knowledge, as opposed to design-management knowledge, can be defined in a similar fashion: ‘knowledge about the nature of the object and material when designers design products and services’; ‘knowledge of various processes that realize a product that is actually designed and, knowledge of the characteristics of the design process that exploits process design’ (Van Aken, 2005). Some researchers defined design knowledge as ‘a way to solve problems, interact with others, work with others, knowledge of people, including understanding of people, companies and trends and societies’; ‘knowledge about artefacts, and an understanding of the environment’ (Friedman, 2000).

The discussions above illustrate that, despite the obvious commonalities, the main difference between design knowledge and design-management knowledge can be drawn: the former is needed by designers when designing, while the latter is related to the strategic use of design and designers in a company. This means that the stakeholder network in design management are much broader and more complex with widely varied needs for the knowledge than in design with more focused and relatively homogenous needs for the knowledge related to designing products and services. Further, there are many stakeholders in design management who do not necessarily understand design well or whose areas of expertise are not directly related to design. To establish how they should approach design management knowledge properly, it is important to understand why they want to learn design management knowledge in the first place.

**Importance of Objectives in Learning**

It is established that prior knowledge, interest, and motivation affect learners' knowledge learning. Many researchers in the field of educational psychology have found that prior knowledge has a great impact on knowledge learning. In addition, motivation and interest has been defined as an important factor influencing on learning behaviour. The factors that influence this knowledge learning can lead to specific learners' needs. These needs are important design factors for constructing a needs-based learning platform. In a similar context, knowledge management and learning management researchers have argued that past learning management schemes have failed because they focus on knowledge content
and not on the learner’s special needs (Soloway et al., 1996). Learner needs are important because learners do not voluntarily participate in educational programs if their needs are not in the program (Wiltshire, 1973). In addition, Boone, Safrit, and Jones (2002) argued that learners have a drastic reduction in motivation to acquire knowledge if there is a gap between their interests and their learning outcomes. When an adult wants to acquire knowledge, the motivation of the learner is a unique essence that is drawn from the needs of individual growth, or is learned by social / environmental pressures.

In addition, knowledge management and learning management researchers argued that it is necessary to develop into a learner-centred model based on a content-centric model that focuses on content and provides certain knowledge contents to all (Soloway et al., 1996). The learner-centred model means that learners construct their own learning environment. The importance of learner needs has been emphasized as the changing learning environment gradually spreads. The system of e-learning can change depending on the degree of knowledge acquisition or the needs of learners such as beginners or experts (Childs, Blenkinsopp, Hall, & Walton, 2005). Knowledge content can be customized and configured according to needs, goals, interests, or other characteristics of learners within the e-learning system. (Barbara & Donna, 2005; Lee, Yoon, & Lee, 2009). Therefore, to provide knowledge based on learner needs, it is necessary to understand their needs and learning objectives.

Moreover, there are stakeholders with diverse backgrounds in design-management fields and activities appear at various levels in practice. Learner needs are likely to be different for each stakeholder because they are involved in different activities and different level. Even if design-management knowledge is provided on the basis of existing topics or issues without consideration of learner needs, there is a gap between needs and design management knowledge. Therefore, this study seeks to identify the learner needs in the context of design management knowledge based on the importance of learner needs to provide appropriate knowledge according to their needs.

**Learning Objective for Design-Management Knowledge**

**Contents Analysis**

*Design Management Journal* and *Design Management Review* were selected for content analysis. 159 papers published in the past five years were reviewed and 359 learning objectives for design-management knowledge (DMK) were extracted. Paragraphs containing the verbs related to learning such as ‘to learn’, ‘to understand’, ‘to know’, and ‘to think’ were collected.

Learners of DMK are generally classified by their roles, such as 'designer' and 'CEO', in the design management literature. Not only did the content analysis extract learning objectives, but it made it possible to establish the links between the learning context and stakeholder’s role by extracting learning objectives and the learner’s learning context together. In other words, learning objectives were connected with what kind of learners they were and why they wanted to learn the knowledge in their contexts. This presented a much more accurate picture of learners’ roles and needs than the conventional classification by discipline-based roles they play in the company, a requisite for designing a needs-driven learning platform.
Most design-management literature describes the design management activities associated with the design-management stakeholders in the corporate environment. It was found that additional content-extraction criteria were needed to find the learning objectives of the learners in academia as well.

To understand researchers’ knowledge learning, the literature on design knowledge accumulation process was reviewed (Owen, 1998). Knowledge is generated and accumulated by research (explicit knowledge) and practical activities (tacit knowledge), and the accumulated knowledge is used to create new knowledge, and the newly created knowledge is used again to create even newer knowledge (Owen, 1998; Nonaka, 2008). Design management research can also be understood in a similar context. Design management academics can create new knowledge based on existing knowledge. The knowledge is applied to design-management practice and newer knowledge is created by theorizing the practice or converting the tacit knowledge gained from the practice into explicit knowledge through research. Therefore, to extract researchers’ knowledge learning objectives, the introductions and the conclusions of literature were examined to mine directly their research objectives. The body of literature contained the learning objectives of the stakeholders in industry while the introduction and conclusion contained learning objectives of the researchers themselves in the form of research aims, rationales, approaches, and methods as well as how and why they conducted the study.

For the extraction of learning objectives, appropriate screening criteria are needed avoid extracting contents other than those directly associated with DMK learning. The verbs were used to extract learning objectives may have sufficiently broad meanings to extract contents associated with ‘knowledge’, but not necessarily ‘knowledge learning’, for example. This is important because literature is bound to contain knowledge as a result of the research. Also, it is necessary to exclude pieces on knowledge learning in areas other than design management. For example, the extracted sentence “most designers have experience in design education and some learned design in apprenticeship” were excluded because the learning is of design skills, not design management knowledge.
Similarly, if the verb ‘understand’ was written on understanding of the purpose and the result of the research, not design management knowledge, sentences and paragraphs were excluded. In addition, the verb ‘to think’ was often used to mean "design thinking", but this was also excluded if the design thinking was not described in connection with the DMK learning.

To summarize, the screening criteria used for extracting design-management-knowledge content are as follows:

1. Content should be excluded when it is not related with knowledge learning (e.g., content on acquiring new knowledge, such as guidelines or a results of research are not relevant to learning itself).
2. Content should be excluded when the contents are not related to design management knowledge, even if it is related to knowledge learning (e.g., most designers have experience in design education and some have learned design through apprenticeship).
3. Content should be excluded when the researcher does not understand the purpose of the study or learn it from the result of the research it is not design-management knowledge.
4. Content should be excluded when it is used to describe 'design thinking', and not knowledge learning.

**Learning Objective for Design-Management Knowledge**

Since similar pieces were collected from different literature, the extracted content was grouped and categorized through the affinity diagram method for which four design-management researchers participated. All participants were familiar with affinity diagram activities and had an in-depth understanding of design management. In the categorization process, the extracted content was first simply placed without discussion, followed by content grouping through collective discussion and coordination. Finally, the grouped pieces were appropriately labelled.

**Findings and Discussion**

There were 21 DMK learning objectives that emerged through the affinity diagram process, in which the links between the roles of design-management stakeholders and their learning objectives were also identified. As part of the content analysis, a frequency
test was carried out on the extracted learning objectives to determine the significance of each learning objective. The 21 learning objectives for DMK finally obtained are presented in Table 3.

Table 3  Learning Objectives

<table>
<thead>
<tr>
<th>DMK Learning Objectives</th>
<th>Learners</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>To acquire knowledge about consumers</td>
<td>Researcher, company, design leader, CEO, executive director, brand team, designer, entrepreneurship, provider, marketer, engineer, designer, multidisciplinary team, student, senior management, design director, team, business stakeholder, organization</td>
<td>45</td>
</tr>
<tr>
<td>To learn integrated knowledge from other areas</td>
<td>Multidisciplinary team, transitional developer, design project team, educator, company, design manager, engineer, employee, researcher, business student, design leader, designer-entrepreneurs</td>
<td>25</td>
</tr>
<tr>
<td>To learn the skills and perspectives of the business</td>
<td>Social network, design leader, CEO, designer, leader, manager, business stakeholder, senior design staff, company, teacher, design student, design entrepreneur</td>
<td>22</td>
</tr>
<tr>
<td>To read opinions and stories from design management practitioners</td>
<td>Researcher</td>
<td>21</td>
</tr>
<tr>
<td>To strategically use designers and designs in the company:</td>
<td>Government, designer, manufacture, corporate, SMEs community, leader, manager, company, employee, researcher, Business student, manager, business stakeholder, business community</td>
<td>20</td>
</tr>
<tr>
<td>To use design knowledge in other areas</td>
<td>Design leader, leader, management and marketing community, designer, non-design colleague, design-process stakeholders, educator, engineering designer, firm, organization, manager, CEO, policy maker, project manager</td>
<td>20</td>
</tr>
<tr>
<td>To set and understand your project's direction for a seamless project</td>
<td>NPD team, team member, engineers, multidisciplinary team, transitional engineer, project leader, company, designer, leader</td>
<td>19</td>
</tr>
<tr>
<td>To find design opportunities for market changes</td>
<td>Design manager design leader, brand team, designer-entrepreneurs, design community, manufacturer, team, designer, researcher, company, design student</td>
<td>15</td>
</tr>
<tr>
<td>To learn about organizational culture development direction</td>
<td>Leader, executive, designer, design leader, design manager, team, 14</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>To take advantage of design at a strategic level</td>
<td>Human Resource, designer, business partner, government, engineer, researcher, design leader, firm, CEO, manager 14</td>
<td></td>
</tr>
<tr>
<td>To share knowledge in common for understanding work within the company</td>
<td>NPD team, designer, multi-disciplinary team, tactical level, operational level, design manager, project team, company 13</td>
<td></td>
</tr>
<tr>
<td>To refer to innovation cases to process in company</td>
<td>Start-up CEO, engineer, designer, business stakeho, design project team, manager, 13</td>
<td></td>
</tr>
<tr>
<td>To get motivation and utilization of research from case studies:</td>
<td>researcher 13</td>
<td></td>
</tr>
<tr>
<td>To understand the flow of academic theory and change</td>
<td>Researcher 13</td>
<td></td>
</tr>
<tr>
<td>To understand concepts in the field of design</td>
<td>Organization, employees, business student, business leader, manager 9</td>
<td></td>
</tr>
<tr>
<td>To understand the role of design and designers</td>
<td>Designer, clients, employees, marketer, researcher 9</td>
<td></td>
</tr>
<tr>
<td>To effectively communicate with managers and designers in the company:</td>
<td>Designer, team, design manager multi-disciplinary team 8</td>
<td></td>
</tr>
<tr>
<td>To understand different perspectives in other fields.</td>
<td>Government, business and students, researcher 8</td>
<td></td>
</tr>
<tr>
<td>To understand the actual applied result of design management theory and applying the project</td>
<td>Student, business school, design leader, university, external stakeholder 7</td>
<td></td>
</tr>
<tr>
<td>To get tacit knowledge through design activities</td>
<td>Designer, leader, educator, business stakeho, student 7</td>
<td></td>
</tr>
<tr>
<td>To understand theory of design management applicable to research:</td>
<td>Researcher 7</td>
<td></td>
</tr>
</tbody>
</table>
The learning objectives and their interpretation are as follows:

1. To acquire knowledge about consumers: This learning objective was most frequently found and many design-management stakeholders in academia and practice were found for this objective. The learning objective was to understand consumer needs and user experience and motivation.

2. To learn integrated knowledge from other areas: This means learning knowledge in marketing, design, service, and management to create organizational value, better leadership, and lower uncertainty.

3. To learn the skills and perspectives of a business: This included stakeholders such as designers and design managers with design backgrounds who wanted to gain business-related knowledge to communicate with people with management backgrounds or to understand the internal relations of the company or internal process.

4. To read opinions and stories from design-management practitioners: The objective was not only to hear the story experienced by actual designers but also to use those stories to establish research purpose through communication with practitioners.

5. To strategically use designers and design in the company: It means understanding how to use the design process, design organization, and understanding what designers are asking and what designers can do.

6. To use design knowledge in other areas: A variety of design-management stakeholders were found for the purpose. The designers were found to communicate their design knowledge to another department than the design department through daily activities.

7. To set and understand the direction for a seamless project: It means understanding the direction of the project within the team and understanding what to do next. It discusses about not only the purpose but also the constraints and the expected results, and includes the understanding of the same contents knowledge within the team.

8. To find design opportunities for market changes: It means that design management stakeholders want to respond quickly to market changes when trends, and cultural influences that change as circumstances arise.

9. To learn about direction of organizational culture development: Various stakeholders in design management academic field were found. It is included what factors should be considered to change the organization, or how to apply the design process to the organizational culture.

10. To take advantage of design at a strategic level: It means understanding the value of design and influence of design found from various stakeholders. Design is not merely a design concept or styling. This learning objective means an understanding of the true value of the process, and the process of using the design to achieve strategic outcomes.

11. To share knowledge in common for understanding work within the company: This objective included the sharing of frameworks to establish
standardized knowledge within the team and understand the business model and functions of the project.

12. To refer to innovation cases to process in company: The learning objectives were discovered from a variety of design management stakeholders, including designers, engineers, and start-up CEOs. It means learning how to design essential product development processes or new models from other companies, learning about the growth of business plans from other companies, or how others work.

13. To get motivation and utilization of research from case studies: There are cases for finding research opportunity is considered. Design management related cases can be used as ideas or motivation for research or for conducting research.

14. To understand the flow of academic theory and change: The objective was to find out the limitations of existing knowledge or to suggest a new model through the process of understanding the changing aspects of academic theories.

15. To understand concepts in the field of design: This learning objective was found from the design management stakeholders, most of whom had management background. Executives often look up design terms, so that they understand the terminology and use it correctly.

16. To understand the role of design and designers: This included how managers themselves are involved in the process, or other stakeholders understand the role of designers in the company to engage strategically in design management.

17. To effectively communicate with managers and designers in the company: This is included that experience of accepting, evaluating, and communicating with others in order to gain new ideas or understanding how the designer understands the market situation and the competitive environment and how to work with the right partners in the organization.

18. To understand different perspectives in other fields: It includes theoretical models based on understanding of the management area and the design domain. Many researchers identified the same research topic in both design and management fields in order to link both discipline.

19. To understand the actual results realized from design management theories and applying them to the project: The learning objective is to know and apply the elements of the theory in order to understand the actual practice. It also includes an understanding of how the theories and concepts learned appear in practice.

20. To acquire tacit knowledge through design activities: It is a learning opportunity through the practice, to experiment with the process, or to learn the new skill by actually training creatively through the project.

21. To understand theories of design management applicable to research: This includes other researchers' understanding or theories, or to be concerned about the research direction from the research by other researchers.
**Structure of Learning Objectives**

The learning objectives extracted through the content analysis are important elements to identify in designing a needs-based DMK platform. To provide knowledge according to learners' needs, learning objectives should be deployed as anchoring points through which appropriate knowledge content can be provided. It may not be appropriate to provide content by considering all the learning objectives extracted through content analysis. However, grouping the learning objectives could help to achieve the learners' goal of learning DMK. Therefore, in this study, the 21 learning objectives were grouped according to content similarity and summarized the final goals of the learners wanting to learn the knowledge.

<table>
<thead>
<tr>
<th>Understanding other fields</th>
<th>Research</th>
<th>Innovation</th>
<th>Communication with team</th>
<th>Strategic use of design</th>
</tr>
</thead>
<tbody>
<tr>
<td>To learn integrated knowledge and perspectives of the business</td>
<td>To read opinions and stories from design management practitioners</td>
<td>To acquire knowledge about consumers</td>
<td>To set and understand your project's direction for a seamless project</td>
<td>To strategically utilize designers and designers in the company:</td>
</tr>
<tr>
<td>To use design knowledge in other areas</td>
<td>To get motivation and utilization of research from case studies</td>
<td>To find design opportunities for market changes</td>
<td>To share knowledge in common for understanding work within the company</td>
<td>To take advantage of design at a strategic level</td>
</tr>
<tr>
<td>To understand concepts in the field of design</td>
<td>To understand the flow of academic theory and change</td>
<td>To learn about organizational culture development direction</td>
<td>To effectively communicate with managers and designers in the company</td>
<td>To refer innovation cases to process in company</td>
</tr>
<tr>
<td>To understand different perspectives in other fields</td>
<td>To understand theory of design management applicable to research</td>
<td>To understand the actual applied result of design management theory and applying the project</td>
<td></td>
<td>To understand the role of design and designers</td>
</tr>
</tbody>
</table>

**Figure 2  Structure of Learning Objectives**

1. **Understanding of other fields**

Understanding the other fields is a goal to see the convergent characteristics of design management knowledge. The learner with a design background wants to learn the skills and viewpoints of a business, and the learner in management or engineering field would want to experience design through design activities. Because learners with management backgrounds do not know much about the design field, it is important to understand the concept of design in the field of design so they can work with the designer or use the design at the enterprise level. Likewise, many learners with a design background wishing to learn 'skills and perspectives on business' were found. This means that not only executives but also designers and design leaders have learning objectives to gain business-related knowledge.

**Research**

The goal of studying the knowledge of researchers in academia is to accumulate new knowledge. Therefore, to use other knowledge, they tried to hear opinions from cases or design-management practitioners. It should be understood that the goal of learning DMK for researchers is different from that of other people, and that the pattern of knowledge use is also different.

2. **Innovation**

Innovation and design management are inextricably linked. Practitioners directly refer to examples of innovation that have been made to achieve innovation. However, understanding the consumer and finding a design opportunity to change the market can
be interpreted as part of the activity to achieve innovation with a company's products and services. It is also an activity for the company to think about and learn about the organizational culture for creative ideas.

3. Communication within teams
The design process is working with various stakeholders, but their backgrounds are different. However, as they work on the same team, the goal is the same. They want to learn the knowledge to achieve the goal of enhancing communication within the team. This means not learning about other areas and understanding each other, but setting the direction of the project at the team level or sharing the same knowledge in common within the team. It is also within the team to learn how managers and designers who are very different from each other communicate effectively.

4. Strategic use of design
There may be learners who do not know the value of the design. They need to understand the value of design and the role of designers. However, they may not recognize their needs for learning DMK. Therefore, a needs-based learning platform should help them realize why they should acquire DMK in the first place. It is also an objective that is directly related to the goal of strategic use of design in the company.

Design Criteria for Needs-Based Learning Platform
As a first step towards designing a needs-based learning platform, this study identified DMK learning objectives. It is necessary to design the knowledge platform from the specific perspectives of the prospective learners rather than those of a general stakeholder. A need-based learning platform is needed to identify design-management stakeholders firstly and provide new knowledge based on their needs. Therefore, in this study, general design criteria for a needs-based learning platform were constructed with possible implications that can be derived from the research findings.

- Learner needs do not exist by themselves and need to be reorganized as a fictional character to design a needs-based learning platform. Personas should be constructed by combining the complex needs of learners in a comprehensive way. The persona should include various needs for knowledge acquisition as well as learning objectives.
- When a learner uses a learning platform, it should have a function that recognizes what type of learner is about to use the platform. If the learner corresponds to a persona, then he/she is led through a learning path appropriate for their needs and acquire the knowledge they need.
- DMK contents can be classified as learner needs and goals. The classification of the knowledge can be provided to a needs-based persona.
- The knowledge content will be able to provide based on the application of knowledge and their current design-management activities. The form and attributes of knowledge they want to learn differ when they acquire knowledge for research and when they actually do design management activities.
Conclusion
Design management is of a cross-functional and multidisciplinary nature. As such, design management has various domains as well as target learner groups with different needs for DMK. The research focused on the upstream research phase as a new way of learning DMK based on target learner needs, establishing a design criteria for a needs-based learning platform.

Major Findings
Firstly, a definition and scope of design management was found through the literature review. DMK is defined as knowledge related to the design-related organization, design vision and strategy, process-using design, environment for design, and designer resource management.

Secondly, it was found that learner attributes, such as prior knowledge, interest, and motivation, have impacts on learning, and these are constituted by different perspective on design management. The findings imply that learner needs in DMK are critical factors that need to be considered in developing DMK learning platforms.

Thirdly, learning objectives are identified as a first step in discovering their needs. 21 learning objectives with different learners in academia and industry are extracted and grouped through a content analysis from the design management literature.

Fourthly, understanding other fields, research, innovation, communication with team, and strategic use of design were found to be the main goals in DMK learning.

Lastly, the design criteria of a needs-based learning platform were proposed. Learner needs serves as a mechanism by which needs-based knowledge providing can be created.

This research makes a contribution by extracting and systemizing learning objectives to be used as a basis for a needs-based integrated knowledge platform. Understanding the learning objective is the first step in understanding how a learner learns DMK. Also, it is a new approach to understand design-management stakeholders from the perspective of learning. This will make a good case for adapting the platform for other multidisciplinary education in the future.

Limitations and Further Studies
For the purpose of this paper, learning objectives for DMK were extracted from design-management literature as a first step toward an understanding of learner needs. The learner needs could be further refined and identified in empirical studies such as interviews or user research. This will help provide special features to attract potential and unaware target-learners of DMK due to its multidisciplinary nature.

References


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