

Personal knowledge management and collaboration of designers during the development period

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ABSTRACT: The popularity of mobile Internet technology has important effects on the personal occupational development of designers concerning knowledge management and knowledge co-ordination, particularly during the early years of their professional employment. Knowledge management and knowledge co-ordination are required qualities of professional designers. In aiming at the early phase of graphic, industrial and interaction designers in professional careers, the research reported in this article features the use of questionnaires and auxiliary user interviews to analyse the knowledge management of designers. It identifies the essential qualities of designers as they develop their personal knowledge management. These include project control, individual performance and display of work. Individual performance and personal knowledge co-ordination, with occupational design characteristics, are preconditions for the successful designer. There are demands from the nature of work and, as individuals develop, they promote the flow of hidden knowledge in the design field, which translates into design ability.

INTRODUCTION

Designing requires proper organisation and skills to solve problems. Designers solving problems are inclined to an engineering approach using basic engineering knowledge, personal qualities of engineers, interpersonal teamwork and engineering system knowledge. The industrial development of China during this period of rapid economic and social development requires large numbers of quality designers. The rapid development of technological industries encourages young designers to keep their knowledge up-to-date. In addition, with the development of mobile Internet technology, there is also a stress on teamwork collaboration and the communication skills of designers.

More complicated problems demand collaborative innovation. Accordingly, key growth factors for designers' skills are personal knowledge management and collaborative abilities. So, design education occurs not only in school but also after school. Knowledge management and the collaborative ability of designers will be part of the development of occupational skills and quality. Paying more attention to the occupational quality of designers will reduce the discrepancy between a university education and the expected abilities of designers from enterprises and the job market.

PROBLEM DEFINITION AND RESEARCH METHODS

Designer Knowledge Systems

The knowledge in design companies or departments is often based on procedures. Hence, this knowledge shows how to carry out the processes in a project or in organisational supply chains [1]. In early practice, knowledge management was passive, did not take account of the human factor and ignored the need to add new knowledge [2]. The design field is a business that involves undertaking projects. Project and product management is thought of highly by design management, but there is a lack of knowledge management for individuals. With the importance of collaboration leading to innovation on complicated scientific knowledge systems, the development of individual knowledge systems is increasingly seen as a critical factor influencing team innovation. Although, competition is an effective approach to motivating students with advanced programming skills [3].

Separate from the schedule management of a project, the designers' individual knowledge systems concentrate on personal knowledge management and innovation, and occupational development (see Figure 1). Projects or products are primary content in the individual knowledge system. Hence, design management is a precondition of a designer's individual knowledge management system. Individual growth by self-study is an important occupational quality. For collaborative innovation requirements, individuals will have only partial knowledge as part of personal development. From the perspective of innovation quality, individual knowledge systems contain personal knowledge management, except for industrial skill definitions, and even include knowledge collaboration. With occupational

knowledge, the individual knowledge management contains hidden knowledge, such as design experience, which is different from the application skills contained in a university education.

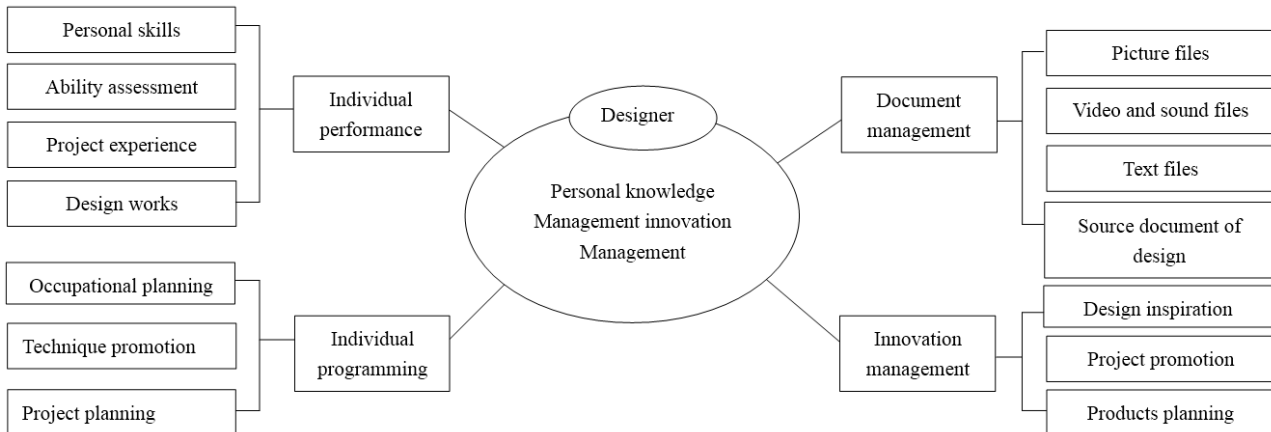


Figure 1: Knowledge system for designers.

Growth Period of the Professional Designer

Education is a study of basic design. But, changing from a student to a professional designer is a transformative period of rapid development. The changes, from being a new to a professional designer, involve many areas of design. This transformation is influenced by two factors. The first is design skills and quality. Some design fields require more rapidly expanding and complicated knowledge, e.g. construction design. But, relatively speaking, there is a fast-growing demand for designers of graphic design and interior design; the second is industry sophistication and the nature of the industry.

Interaction design and interface design are emerging design fields reflecting the growth of the mobile Internet times. The design tends to be iterative and involve agile research and development. The growth period for designers is relatively short: three plus years for starters, five plus years for a senior and ten plus years for a leading designer. Shorter growth periods require more self-study by designers.

Generally speaking, the designer solving realistic problems has a five-year period of developing professional skills. This relates not only to design skills, but also to individual management, self-promotion, teamwork and collaborative innovation. The collaborative training at university has differences that arise from realistic vocational requirements. The vocational characteristics include cross-disciplinary, cross-field, cross-region and even cross-cultural requirements. Carrying out investigations on designers whose mature growth period is considered less than five years reveals the demands of personal knowledge management and collaboration in the construction of a personal knowledge system, and reveals the value of quality development effected by knowledge collaboration.

Research Subjects and Instrument

Characteristics of the selected sample of designers are as follows (see Figure 2):

- Working time:

All less than or equal to five years of which, < 0.5 years was 11.77%; 0.5-1 year was 29.41%; 1-2 years was 31.37%; 2-3 years was 11.76%; and 3-5 years was 15.69%.
- Occupational category:

Graphic design (41.18%), industrial design (21.57%), interaction and information design (11.76%), environmental art design (9.8%), cartoon design (9.8%), and so on. (Note: construction design is not included because of its long growth period.)
- Job rank:

They are involved in direct design work. A number may have some management responsibilities, but none is a team leader or supervisor or higher.
- Gender balance:

The male/female gender balance was 1:1.

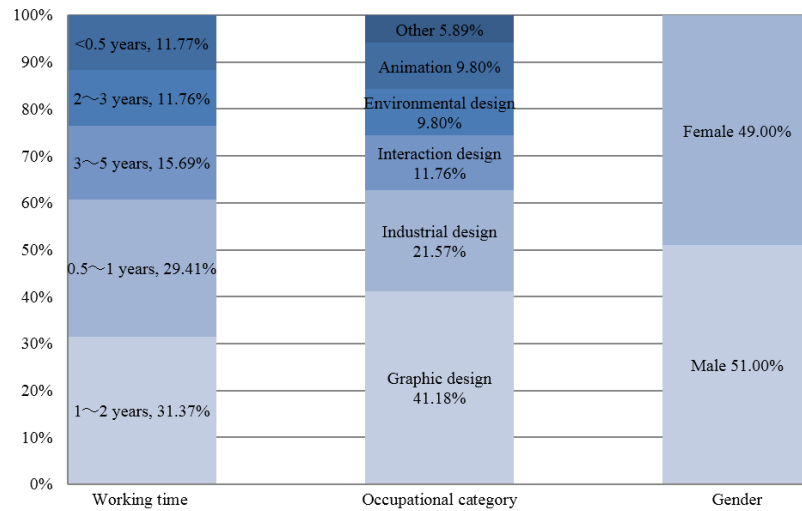


Figure 2: Characteristics of the participants.

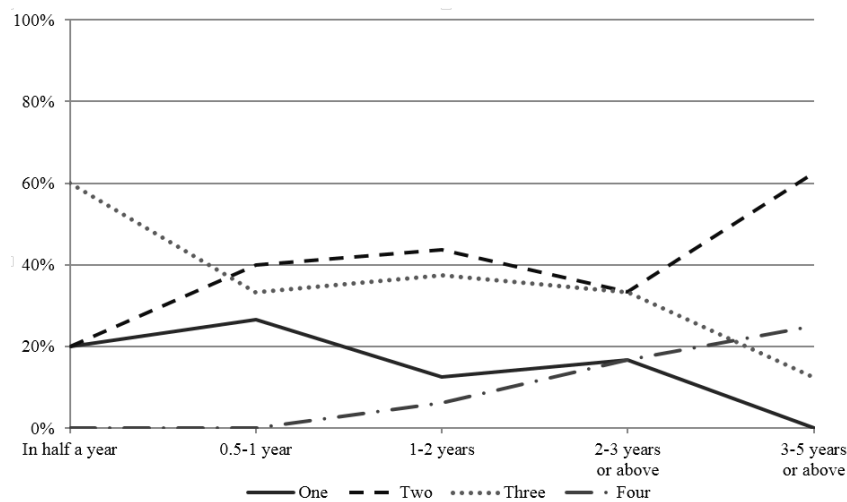


Figure 3. Working seniority of participants.

An on-line questionnaire was used in the research. Fifty-one questionnaires were sent to designers at new media enterprises, such as Weibo@ and Weixin Circle. The forms were designed to produce accurate information about the design occupation. Five responses were selected for a deeper, further investigation of the participants' knowledge management and knowledge collaboration. This revealed that they carry out competitive product analysis of popular PC and mobile software tools, which identified the knowledge management and collaboration of the designers.

PERSONAL KNOWLEDGE MANAGEMENT OF DESIGNERS

Multi-project Working

In actual work, designers often participate in several projects at the same time. Only 16% of the sample participated in one project at the same time, 41% in two, 35% in three and 8% in four or more projects at the same time. Hence, the norm is for designers participating in 2–3 projects, while four or more would be in a high stress environment. It would be expected, that those simultaneously participating in four or more projects would be senior employees.

In Figure 3, the orange line shows that the number of projects increases with seniority. The blue line indicates that, with more experience, designers are less likely to participate in only one project. Thus, project quantity is a simple and direct measure of work pressure. More skilful designers participate in more projects, which also means more work pressure and responsibility.

Document Management

Participating in several projects requires project documents for designers. File management is one of the important components of individual knowledge management for designers, as indicated in Figure 1. Results of the questionnaires show that over 86% of project teams regulate the names of files, as shown in Figure 4. However, document confusion still occurs. As shown in Figure 5, there is document confusion on close to 73 % of projects, including some confusion

on 69% and much confusion on 4% of projects. Thus, despite clear regulations on nominated names there is still document confusion. Document management of a project is important for design management and project control.

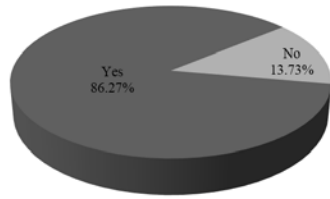


Figure 4: Nominated file names for projects.

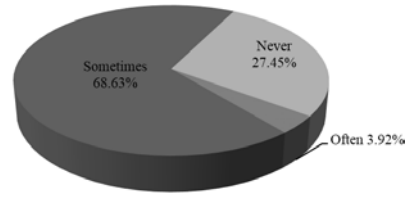


Figure 5: Mixing documents for different projects.

Design Management Factors and Seniority

For common organisations, the designer’s individual knowledge management becomes an essential part of knowledge management for the whole organisation. It is necessary to pay attention to how management factors change with seniority. Table 1 shows that designers working for less than half a year judge the deadline of the project as the most important factor, alongside self-research and self-development. However, for designers with 3-5 year working experience, self-research and self-development are much less important. Thus, strengthening individual knowledge management of designers during their early years of employment is a realistic project control requirement.

Table 1: Important project factors by seniority.

Working seniority (years)	Deadline of project	Level of project	Stage of project	Difficulty of project	Self-research, self-development	Economic benefits	Other
Less than 0.5	4 (80%)	3 (60%)	1 (20%)	1 (20%)	3 (60%)	4 (80%)	0 (0%)
0.5-1	8 (53.33%)	8 (53.33%)	5 (33.33%)	2 (13.33%)	3 (20%)	7 (46.67%)	2 (13.33%)
1-2	9 (56.25%)	11 (68.75%)	5 (31.25%)	7 (43.75%)	4 (25%)	5 (31.25%)	2 (12.5%)
2-3	2 (33.33%)	3 (50%)	3 (50%)	1 (16.67%)	1 (16.67%)	3 (50%)	0 (0%)
3-5 or above	3 (37.5%)	4 (50%)	3 (37.5%)	3 (37.5%)	2 (25%)	5 (62.5%)	0 (0%)
No reply	1 (100%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

The development of technique and ability is closely related to the experience of participating in projects. The factors affecting the development of individual ability and occupational quality in the early years of employment include: the design project, i.e. participation, difficulty and role; the design work; organisational management experience; theory and business knowledge acquisition; software technology and tools; and honours and qualifications.

Individual Knowledge Management

Individual knowledge management normally has not been a part of design management, the latter concentrating on schedules and project management. But, individual knowledge management performance is related to necessary objective and individual values. For example, through this investigation, designers are required to submit design works or licences 84% of the time (61% sometimes and 23% often) and so, this is a normal occupational requirement.

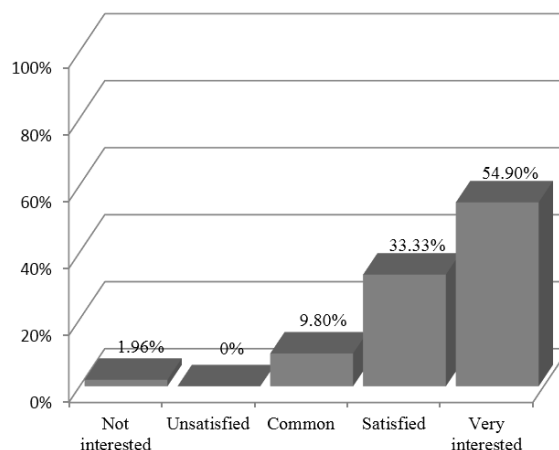


Figure 6: Desire for individual achievement.

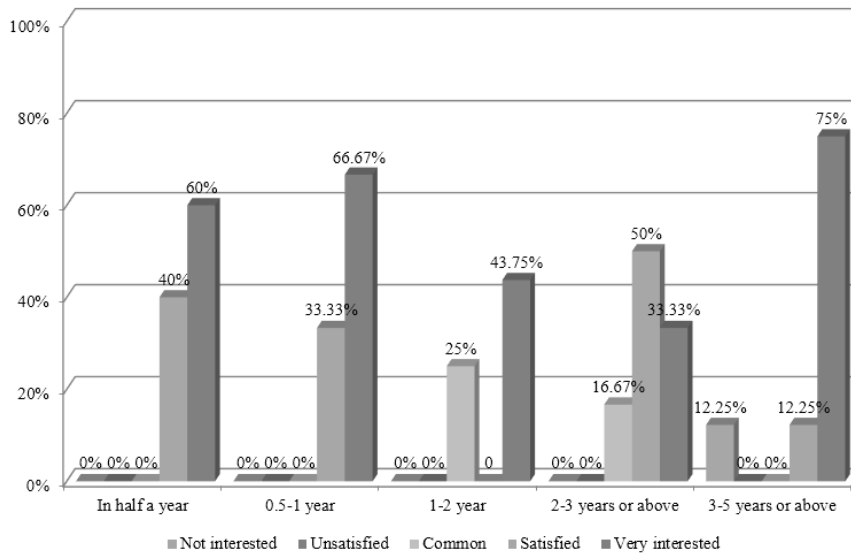


Figure 7: Desire for individual achievement by seniority.

As shown in Figure 6, the desire for individual achievement is about 88% of designers. In the group of working seniority of 3-5 years, this reaches the highest rank among all the groups. It is worth mentioning that this desire shows a U-shape with working seniority (see Figure 7).

COLLABORATION

Project Teams

Successful projects have a design team with innovation and customer service skills. Design schedule management has six characteristics, viz. complementary techniques, co-operation, positive participation, adventurous spirit, civilised arguments and individual accountability [4]. All have a close relationship to team collaboration, rendering it a necessary feature of the design project.

Collaboration is a way to guard against occupational pressures, e.g. the need to innovate, bidding for work and replacing products. Smoothing these pressures relaxes external environments, opens information channels and allows time for study and communication [5]. Sharing knowledge in work collaboration shores up the ability to manage occupational pressure.

Design projects are usually undertaken by teams. If there is a conjunction of purposes and tasks for different people, collaborations are inevitable. As shown in Figure 8, designers ask for documents for 69% of projects. Inter- and intra-project collaboration is normal. As shown in Figure 9, documentation from over 82% of projects is provided to other projects.

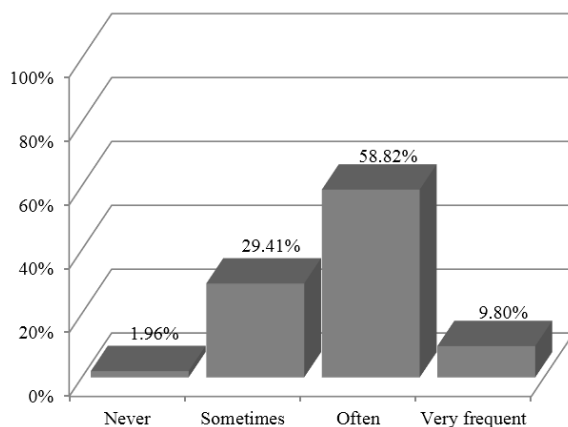


Figure 8: Providing documents within the project.

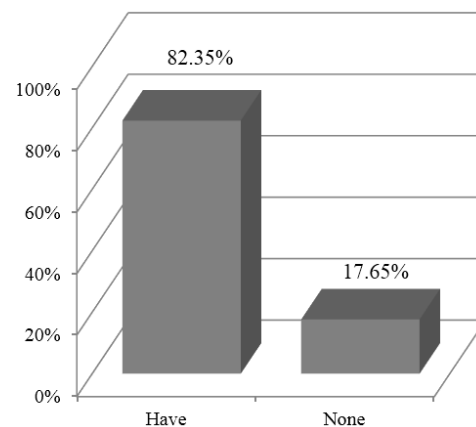


Figure 9: Providing documents to other projects.

Collaboration and Knowledge Management

Advanced Internet technology promotes globalisation and the knowledge economy. Knowledge sharing and knowledge integration as a collaborative process strengthens knowledge interaction. Collaboration is the deepest form of knowledge interaction [6]. For designers, knowledge management promotes integration between design and nature.

Knowledge collaboration involves passing appropriate information to a target or object at an appropriate time and in an appropriate space, which may be real or virtual. The process may be one way, two way or multi-way, the last being an advanced stage of knowledge management [7].

Cloud storage software is the most common tool to help designers collaborate. Documents provided to designers can be stored in the cloud and only 10% of designers never use the cloud. Cloud software now has collaborative functions and with the further development of design management and integration with mobile Internet technology, the proportion of designers not using the cloud will continue to fall.

Knowledge collaboration has innovation based on knowledge management as its target [8]. For the design team, knowledge collaboration means integrated innovation during the process of designing. For a design company or enterprise, knowledge collaboration involves intelligence gathering, resources co-ordination and mutual co-operation [9].

The Design Enterprise

The design enterprise is organised as individual-team-department-enterprise. However, the development of information technology and changing market requirements generate a new requirement for a flatter, more agile structure. Emphasis on knowledge collaboration is an important way to integrate and balance these requirements. Basically speaking, design is a creative activity and so creative ability is one of the necessary qualities of a designer.

As China develops into an advanced economy, innovation shall be at the heart of its industrial economy. Innovation promotes the collaborative integration between the design industry and the manufacturing industry. Designers are aware of this trend, which is supported by knowledge collaboration.

Hidden knowledge

Hidden knowledge is very important and plays an indispensable role in design, and even becomes a necessary part of the individual knowledge system for designers. Innovation inspiration, design thinking and creativity all accumulate with long-term design experience. Study of these types of knowledge at school is limited by the environment, resources and methods and so, these kinds of knowledge are acquired during actual work. With the development of knowledge collaboration, hidden knowledge can be shared by designers through communicating, i.e. by chatting, observing, simulating and practising. In addition, these personnel acquire knowledge from the external environment through various channels [10].

Designer Knowledge

The results show that about 22% of designers frequently face the problem of not understanding the system they are using. The update of design software makes the compatibility problem more unavoidable. As for addressing this problem, there is a phenomenon known in which designers with short working experience will first choose to gain knowledge of the relevant software, e.g. instant message apps QQ, Weixin. In the process, hidden knowledge is transmitted [11].

Designers with longer working seniority are better at exploration and working by themselves. If they need external help, they could rapidly find an efficient way of obtaining it, e.g. from a forum or circle of friends. Designers of new products gain *invisible* knowledge through long-term practice and study, especially invisible processing knowledge [12].

Hidden knowledge flows in collaborations. With increased working seniority, hidden knowledge gets transferred to obvious knowledge, and individual experience becomes occupational common sense. In this process, knowledge collaboration promotes the flow of hidden knowledge and becomes the necessary essence of designers during their early experience as a designer.

CONCLUSIONS

Knowledge management promotes design talent in professional designers in the actual design environment. A successful project needs a good design team, with the designer as the key component. When facing challenges of how to creatively solve realistic problems, knowledge collaboration becomes a necessary occupational quality. With the development and promotion of individual quality, knowledge collaboration is also a reflection of the development of knowledge management. The rapid development of information technology provides more channels or platforms for knowledge and knowledge collaboration.

A designer during the early stages in the occupation should consciously use these tools to promote the improvement of their personal knowledge, in order to satisfy occupational quality requirements. Individuals should collaborate with knowledge integration across the whole design group or enterprise organisation, to improve the occupational role of designers. These changes include:

- Moving from a technique system to a knowledge system;
- Moving from project management to knowledge management;
- Transforming occupational requirements to individual quality;
- Collaboration ability to innovative ability.

Finally, this should develop high quality designer talent that continues to develop, even after the initial period in the industry.

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