

Effective Ways of Enhancing Communications in Design Process: A Preliminary Study

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Abstract. The major task of Industrial Design Department is to accomplish the company's goal through product creations. Since this is an interdisciplinary task inherently, effective communications with various peer departments are crucial. However, different departments always have conflicting agendas and varied aspect of focuses towards the company's goal. Thus effective communication between peer departments is a requirement of building consensus, which will enhance cooperation between them to achieve the company's goal collectively. The aim of this research is to summarize effective ways of communications in product development and design process that industrial design team managers can take as the reference to enhance their design management performances. Since the research project is still going on, this paper will include the preliminary study of this research only. We investigated existing research results and developments on communications and product development comprehensively through literature review. In conclusion, we summarized existing knowledge concerning the topic of communication in product development into a questionnaire, twelve questions was developed in this questionnaire for further in-depth interviews with design managers to elicit more replies of their valuable experiences. We hope that the result of this research could help to enhance communication performance in the industrial design team, which will be beneficial for the companies that they are serving.

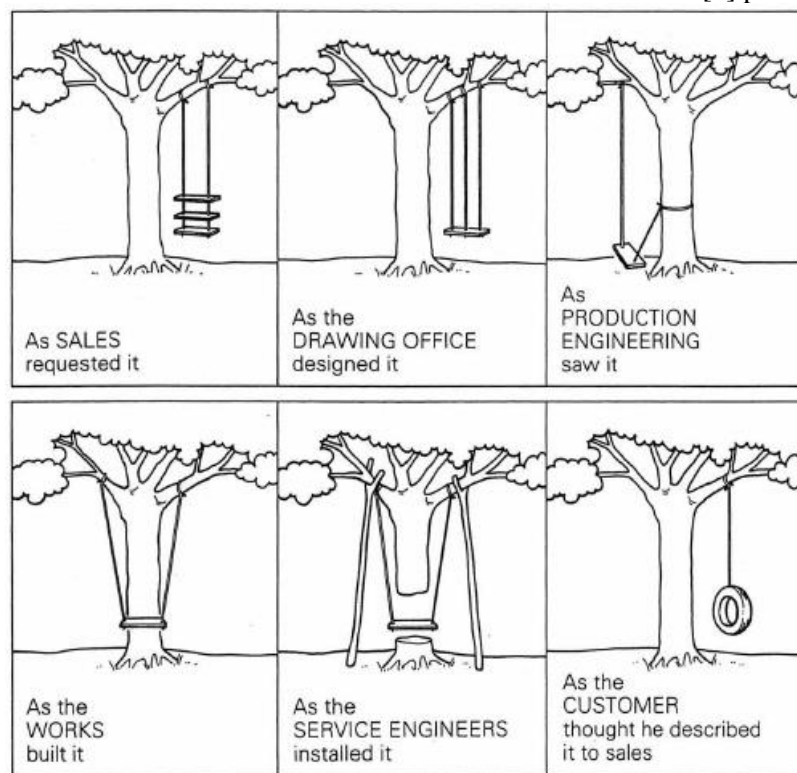
1. Introduction

In a speech on quality and competitiveness at a major conference among top executives in London held by Michael Smith of APV /Baker Perkins Machines in 1981, he showed his audience figures of the notorious 'swing syndrome' [1] (Figure 1) which effectively illustrated the perils of poor communication between departments during product development.

In this illustration, Smith interestingly presented the confusing results entailed by erroneous interpretations on consumer needs. It clearly demonstrated the common facts that are occurring in businesses during product development. Moreover, this illustration had also made it self-evident that effective communications are highly crucial for satisfiable performance in product development. Therefore, this research is set out to investigate the effective ways of enhancing interdepartmental communication performances for industrial design teams in Taiwan. The research objective is to conclude with some useful references for Taiwanese managers to take as the toolkit to enhance communication performance in their industrial design teams. Although the research conclusions can serve as references to managers in Taiwan specifically due to the cultural distinctions of the topic of communications, nevertheless, they will still be worthwhile for taking into considerations of benchmarking for managers who are even not in the similar cultural background as Taiwan.



Source: Peters [1] p.120

**Figure 1.** The swing syndrome.

2. Literature reviews

Before we began to conduct our in-depth interviews, it is obvious that a sound foundation is a prerequisite for designing an appropriate set of questions to elicit useful comments from our interviewees. There is no doubt that such a sound foundation must come from reviewing literature in the vast area of communications. Following some initial surveys, we defined the topic domains as communication theories, organizational communications, industrial design teams, and communications in the design process. The essential literature reviewed in this stage are as follows:

2.1. Communication Theories

Before we can send our signals to others effectively, others will find us hard to understand mostly, and the other way around is always also true. Therefore, communication remains a tough problem for every one of us to tackle with great efforts. Since this is also the core issue of this research, the essential literature was reviewed here briefly.

2.1.1. Defining Communication.

The definitions of the word "communication" provided by Oxford Learner's Dictionary [2] are:

- *The activity or process of expressing ideas and feelings or of giving people information.*
- *Methods of sending information, especially telephones, radio, computers, etc. or roads and railways.*
- *A message, letter or telephone call.*

The significant points in these definitions are "activity or process of expressing ideas and feelings or of giving people information," "Methods of sending information," and "A message." To summarize the definitions made by Shannon & Weaver [3], Anderson [4], Compton & Bennett [5], Barnard [6], Schramm & Roberts [7], Deaux, Dane, Wrightsman, & Sigelman [8], and Coulter & Robbins [9], communication involves three crucial conditions:

- a) It must be performed mutually and is impossible to accomplish unilaterally.
- b) The signals utilized in the communication must be understandable by the both sides.
- c) There must be an intention to send signals.

2.1.2. The Process of Communication

Shannon and Weaver [3] were pioneers of defining the communication system as a combination of the elements including information source, message, transmitter, signal, noise source, received signal, receiver, message, and destination, which clearly delineated the components and the process of communication as shown in Figure 2.

Source: Shannon & Weaver [3] p.7

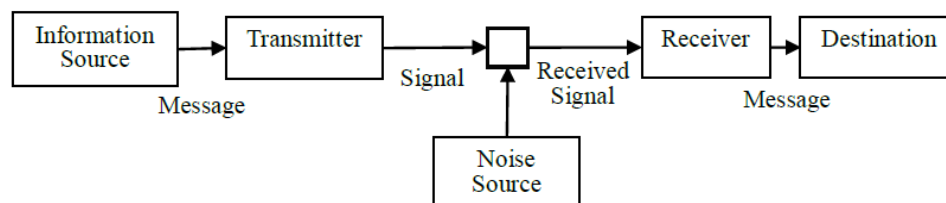


Figure 2. The communication system.

2.1.3. The Principles of Communication

Based on their research on communications, Cutlip & Center [10] pointed out “The Seven C’s of Communication” as principles of effective public relations as follows:

- *Credibility*: Communication starts with a climate of belief.
- *Context*: A communication program must square with the realities of its environment.
- *Content*: The message must have meaning for the receiver and it must be compatible with his value system.
- *Clarity*: The message must be put in simple terms.
- *Continuity and Consistency*: Communication is an unending process.
- *Channel*: Established channels of communication should be used - channels which the receiver uses and respects.
- *Capability of the audience*: Communication must take into account the capability of the audience.

2.2. Organizational Communications

Organizations are complex combinations of a number of people. Stemming from the fact that even communication between two persons would be complicated enough, the complexity of organizational communications will certainly increase in proportion to the size of the organization in question. Also, the effectiveness of organizational communications will affect the organizational effectiveness heavily.

2.2.1. Defining Organizational Communications

In a survey conducted by Thomas and Schmidt [11], their research result clearly suggests that managers from middle to top levels are all holding an active and growing interest in learning more about both the prevention and management of conflict. Also, Luthans, Hodgetts, & Rosenkrantz [12] found that the constitution of managers’ contribution to organizational effectiveness was as follows: interpersonal network (11%), traditional management (19%), human resource management (26%), and daily communications (44%). These figures showed clearly that daily communications are occupying a significant portion of managerial contribution, and this number must be in proportion with their workload as well.

2.2.2. Categories of Organizational Communications

There are several ways to categorize organizational communications, Rasberry and Lindsay [13] suggested the following forms of categorization:

a) Formal organizational communications

There are two ways to categorize formal organizational communications. The first way is to categorize according to the direction of communications such as upward, downward, horizontal, and diagonal communications. Another way of categorization is divided according to the styles of communication loops such as circle, chain, Y, and wheel shaped loops, as shown in Figure 3.

Source: Rasberry & Lindsay [13] p.93

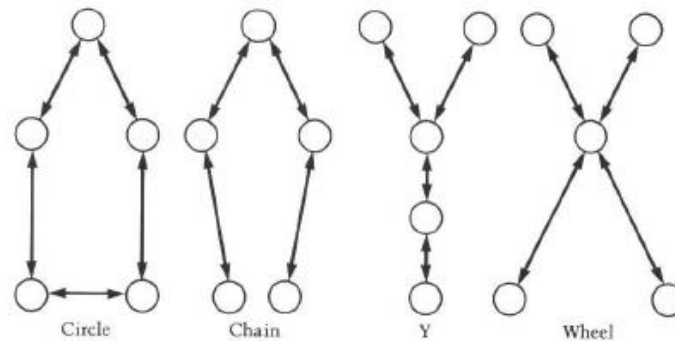


Figure 3. Four types of communication loops.

b) Informal organizational communications

Organizational communications happen in informal settings include types of path such as single strand, gossip, probability, and cluster communications, as shown in Figure 4.

Source: Rasberry & Lindsay [13] p.80

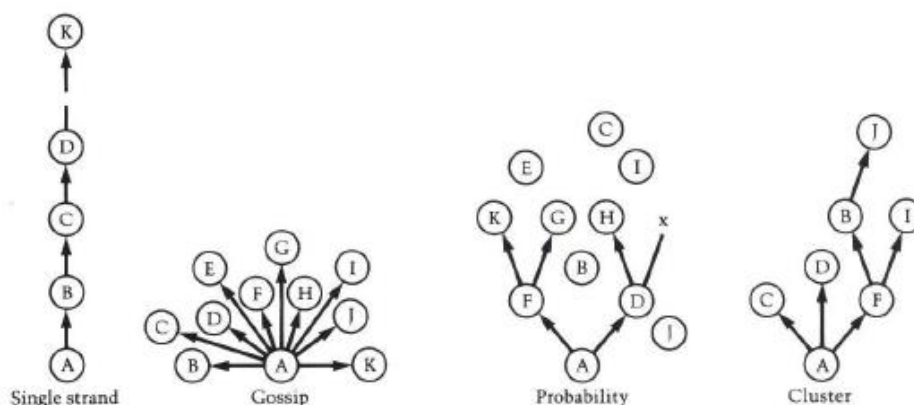


Figure 4. Four paths of informal communication.

According to the description of ways to categorize organizational communications by Rasberry and Lindsay [13], their research suggested the system of categorizing organizational communications as shown in Figure 5.

Source: This research

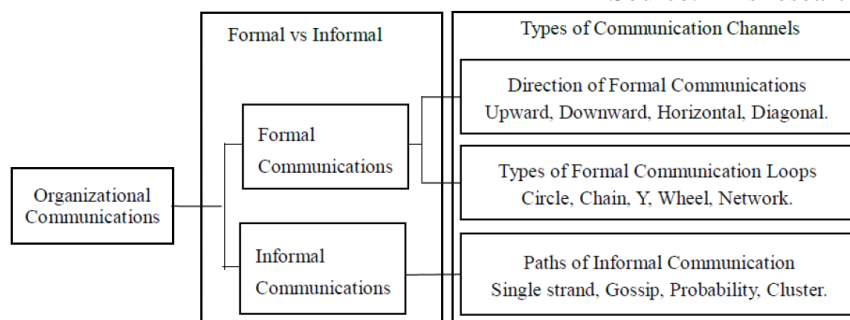


Figure 5. The system of categorizing organizational communications.

2.2.3. Roles in Organizational Communication

Besides the traditional roles of organizational communications in terms of transmitter and receiver, Rogers and Agarwala-Rogers [14] suggested many additional important roles in their arguments including gatekeepers, liaison, opinion leader, and cosmopolite. Their brief explanations are as follows:

a) Gatekeeper

An individual who controls the messages flowing through a communication channel.

b) Liaison

An individual who connects two or more groups of members without themselves involved in any one of the groups.

c) Opinion leader

An individual who is capable of influencing other members' behaviors or attitudes.

d) Cosmopolite

An individual who has a relatively high capability of communication outside of the organization.

2.3. Industrial Design Teams

In addition to acquired understandings on the theories of communication and organizational communications, this research had explored the combination of these theories with the unique characteristics of industrial design teams. There are two aspects of explorations in this regards, including the tasks and the in-house design process of industrial design teams.

2.3.1. The Tasks of Industrial Design Teams

Cooper & Press [15] argued that there is certainly no need to restrict the task of industrial design teams to merely the creation of shapes, colors, and dimensions of products. Successful designs must also take the economic and technological considerations into account as well, so that industrial designers can satisfy user needs to a good extent with appropriate design strategies. At the 29th general assembly in Gwangju, South Korea, the ICSID (International Council of Societies of Industrial Design) [16] announced a renewed definition of industrial design as:

Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences (<http://wdo.org/about/definition/>).

To summarize the above views on the task of industrial design, it clearly is a synthesized consideration of the relationship between mass produced products and their users. To better fulfill such a widely related content of tasks, it is crucial that there must be a well-orchestrated interdisciplinary collaboration among the peer departments of product development. There is no doubt that such a smooth collaboration between disciplines must come from successful communications.

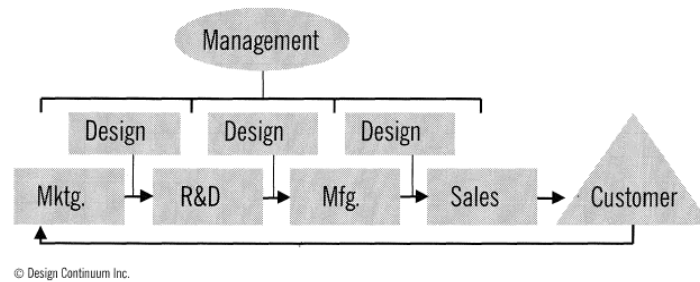
2.3.2. The Design Process and Industrial Design Teams

In searching for better collaborations among peer departments of product development, Zaccai [17] found that the key to well-integration in product development after a split of tasks between departments of various disciplines is the process. He suggested that the standardized process of product development is the modulator of communication flows between disciplines, and further summarized three models of collaboration in product development.

a) Traditional product development

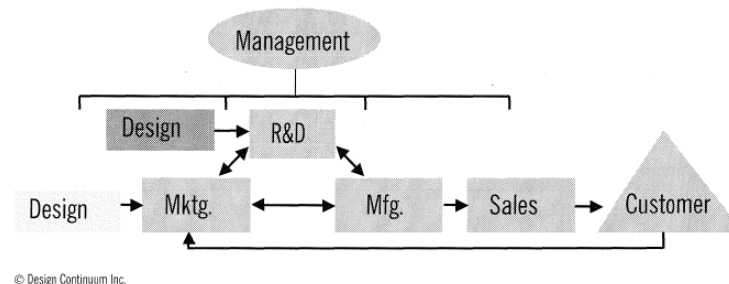
Traditionally, the development project are handed over from one department to another, and industrial designers are viewed as decorators and usually brought in at the last moment but isolated from the product development process, as shown in Figure 6. This type of product development process typically leads to the perils of poor coordination depicted in Figure 1.

Source: Zaccai [17]

**Figure 6.** Traditional product development.*b) Partially integrated product development*

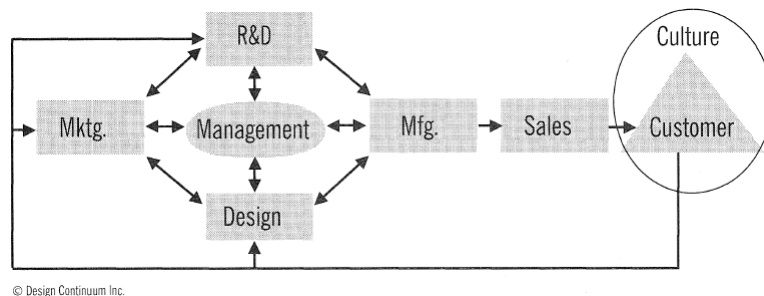
As an improvement of the traditional process, there emerged among American manufacturers was a new model, which Zaccai [17] referred to as the Partially Integrated Product Development Process, as shown in Figure 7. In this improved model, R&D, marketing and manufacturing began to work more closely. However, top managements still remain distant from these development activities. As indicated in the figure, the word “partially integrated” was denoting the triangle consists of R&D, marketing and manufacturing, in which they are better integrated than before, whereas industrial designers are still excluded from this integration.

Source: Zaccai [17]

**Figure 7.** Partially integrated product development.*c) Fully integrated product development*

Zaccai [17] found that more and more firms had come to realize that design is a precise problem-solving methodology instead of merely making things pretty. To garner the merit of designers' contribution, these firms developed a “Fully integrated product development process,” as shown in Figure 8. In this model, constant cooperation and communication are encouraged, and management began to take the critical role as central coordinator. Also, designers had now become equal partners in it.

Source: Zaccai [17]

**Figure 8.** Partially integrated product development.

In addition, Cooper and Press [15] also concluded that most Japanese firms have design process lie at the heart of their innovation activities. They interpreted this process in two ways:

d) Task oriented internal process

This model represents the creative activities that designers are performing to tackle with specific problems. There are five phases in this model including “Defining problem”, “Understanding problem”, “Thinking about problem”, “Developing idea”, as well as “Detail design and test”.

e) Action oriented external process

This model of process represents the design activities that are operating in organizations. There are four phases in this process, including “Concept”, “Embodiment”, “Detail”, and “Production”. Furthermore, Hollins & Hollins [18] held similar concept as Walker [19] to develop the model of “Total Process of Design within Management.” They both see design as applying technologies and developing product concepts and meeting the needs of the market externally so that their model had included the “Action Oriented External Process” as a part of it, as shown in Figure 9.

Source: Cooper & Press [15] p.38

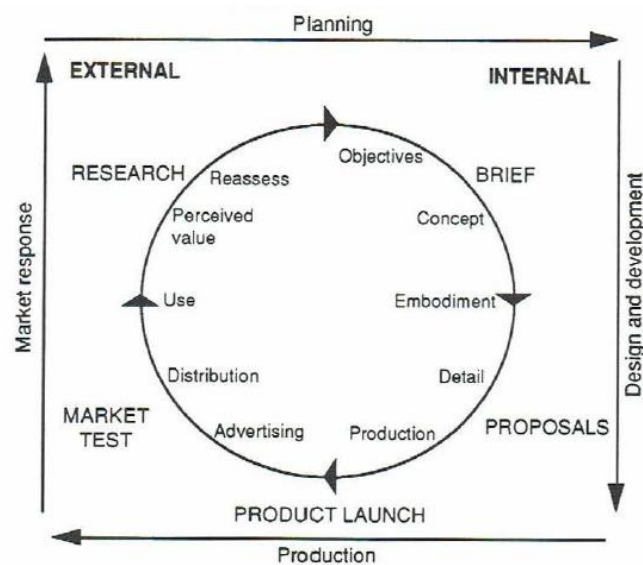


Figure 9. The total process of design within management.

In the above three models of product development process, they had revealed various routes and contact points of communication between functions involved in activities of product development. These facts are valuable information for reference of this research.

2.3.3. Collaborative Design

The intensified international trade and more globalized enterprises had long forced the process of product development to extend far beyond national borders. Also, product development among collaborative companies or between different locations of a company had become a common phenomenon. Such kind of collaboration between scattered locations had given rise to the issue of communications particularly since it has become much more difficult than those who are in the same place at the same time. In solving communication problems in this regard, Saad & Maher [20] proposed a Time-Space Matrix (as shown in Figure 10) that is useful in analyzing different situations under such kind of conditions.

Source: Saad & Maher [20] p.728

	Same Time	Different Time
Same Place	Face to Face Interaction (Meeting Room)	Asynchronous Interaction (Bulletin Board)
Different Place	Synchronous Distributed (Video Conferencing)	Asynchronous Distributed (E-mail)

Figure 10. The Time-Space Matrix.

2.4. Communications of Industrial Design Teams

The interdisciplinary nature of product development and the fact that industrial design is only a part of the product development process both made communication destined to be a key of success for managing industrial design teams. This section explores the issue of communication of industrial design teams in terms of its key skills, strategies, and roles:

2.4.1. Key Communication Skills in the Design Process

In investigating the key skills required in managing client relationships and guiding design decisions, Best [21] summarized that communication is the most crucial part of these requirements. She further analyzed these skills into the following branches:

a) Verbal skills

Individual differences in viewpoints and communication styles can create major barriers to effective communication. Therefore, effective communicator must be competent in verbal dialogue so as to get message across to the receiver persuasively and promote good mutual understandings. Also, a strong will to understand the viewpoints of the receiver is essential to be understood successfully.

b) Interpersonal skills

Communication is basically an issue of dealing with other people, therefore, interpersonal skill is always crucial for effective communication. Listening instinctively while speaking clearly, diplomatically, and sensitively are deemed as good interpersonal manners mostly. More importantly, empathy is a useful manner, which can build an avenue for seeing things from others' point of view clearer and make the other interpersonal skills more effective.

2.4.2. Communication Strategies in the Design Process

In the research conducted by Williams & Cowdroy [22], they identified the strategies available for design teams as two categories and six strategies. The category of verbal strategies includes strategies of technical language and analogy, while the category of visual strategies includes strategies of gesture, sketching graphics, existing graphics and actual objects as follows:

a) Verbal Strategies

- *Technical Language*: This strategy refers to the deliberate use of specific technical terms in communication activities to represent an image of professionalism.
- *Analogy*: This strategy includes three ways of analogy, i.e. project specific analogy, domain specific analogy, and external to domain analogy. The strategy of Project Specific Analogy refers to the use of examples drawn from the specific project that both sides of the communication are working on. The strategy of Domain Specific Analogy involves the use of examples within the industry domain where both sides of the communication sharing experiences. The strategy of External to Domain means communications using examples taken from other industry domain where both sides are not belonging.

b) Visual Strategies

- *Gesture*: This strategy mainly uses hand and arm movements to illustrate aspects of design such as size, function or mechanism, the relationship between product parts, and shape.
- *Drawing*: This strategy is the use of graphics and freehand drawing in communicating specific designs. It is after the above strategies had failed to get messages across when drawings come to the fore usually, although some members may have a better capability in illustrations and thus tend to adopt this strategy earlier than others.
- *Existing Graphics*: This strategy involves the use of drawings and pictures accumulated in the progress of the project in hand or those documents collected for this project.
- *Actual Object*: There are times when communications require complements of real objects, especially prototypes or mock-ups which can be very effective in proving some points than many words.

In addition, Williams & Cowdroy [22] had analyzed more than 14,000 interactions in product development research; they found that the most frequently used communication strategies is technical language (54.8%), followed by charts (24.73), the gap with other strategies are very significant, as shown in Table 1 below:

Table 1. The frequency of communication strategies used.

Technical language	54.80%
Project analogy	2.65%
Domain analogy	2.92%
External analogy	2.45%
Gesture	8.25%
Sketch	3.45%
Chart	24.73%
Object	0.70%

Source: Williams & Cowdroy [22]

2.4.3. Communication Roles in the Design Process

Through her research on communication roles during product design process, Sonnenwald [23] concluded the result of five roles that she observed spanning across formal organizational boundaries: sponsor, interorganizational star, intraorganizational star, intergroup star, and intragroup star. She found that although traditional organizations usually do not have these roles formally, they are instrumental in multidisciplinary tasks such as product development.

a) Sponsor

This is a role which secures the support and funding for the design project in the organization, and aligns the goal and strategies of the design project and the organization.

b) Interorganizational Star

The function of this role is to interact with others in the larger organization and peer departments, such as a project leader.

c) Intraorganizational Star

This role takes charge of transmitting and filtering information on the project's goals, plans, tasks and budgets within the design project, such as group leaders in the project.

d) Intergroup Star

This is a role which represents his or her group to coordinate activities and strategies across groups of the design team.

e) Intragroup Star

This role mainly facilitates interactions among members of his or her group by providing them with socio-emotive supports and conflict resolution helps.

3. Summary

Based on the above literature review, we distilled four aspects of knowledge concerning the topic of communication in product development. They were Communication Theories, Organizational Communications, Industrial Design Teams, and Communications of Industrial Design Teams. Then we further divided these four aspects into ten issues for our further research into communications in product development. They include Principles of Communication, Defining Organizational Communications, Categories of Organizational Communications, Roles in Organizational Communications, The Tasks of Industrial Design Teams, The Design Process and Industrial Design Teams, Collaborative Design, The Key Skills of Communication in the Design Process, The Strategies of Communications in the Design Process, and Communication Roles in the Design Process.

3.1. Communication Theories

As communication is such a crucial knowledge for better interactions between people, it has long been a popular research topic widely. Therefore, the existing theories are abundant for exploration, and they will help a lot to lay the cornerstone for this research.

3.1.1. Principles of Communication

For a solid fundamental understanding of the basics of good communication, the principles of making effective communication in the existing literature must be studied first.

3.2. Organizational Communications

Even communication between two persons would be complicated enough; nevertheless, most organizations consist of three or more members. Therefore, the issue of effective organizational communications will certainly be a highly complex one to tackle. However, it will be worthwhile to pay great effort since communication holds the key to organizational success no matter how good the members are.

3.2.1. Defining Organizational Communications

Seeking definition involves digging into the essential characteristics of any issue in question. Therefore, it always is a highly important topic to explore when we are trying to be knowledgeable in any area. Thus there is no exception when we are at the outset to acquire the existing knowledge in the field of organizational communication.

3.2.2. Categories of Organizational Communications

While we studied any topic in depth enough, it eventually comes to the stage where we become capable of analyzing characteristics of the subject, and thus we may find that the subject has its characteristics vary according to certain circumstances; such a variation can divide the subject into categories. Therefore, identifying categories of a subject is also a way of deepening our understanding of it.

3.2.3. Roles in Organizational Communications

Most organizations are consist of so many individuals that the interactions among its members become a complex web with various kind of relationships. To enhance these various relationships, it eventually requires different roles being played by specific members. Therefore, identifying the roles in organizational communications is also a useful way of understanding these relationships. Therefore, we will like to know what kind of communication roles our interviewees' companies have for their product development.

3.3. Industrial Design Teams

Since this research is going to apply our understandings on the issues of communication theories and organizational communications in industrial design teams, thus we should take a look at the unique characteristics of industrial design teams here. There are two aspects of explorations in this regards, including the tasks and the in-house design process of industrial design teams.

3.3.1. The Tasks of Industrial Design Teams

The traditional task of industrial design teams is merely the creation of shapes, colors, and dimensions of products. However, many successful in-house industrial design teams had also demonstrated their capability to take the economic and technological considerations into account, so that industrial designers can satisfy user needs to a good extent with appropriate design strategies, such as the example that we have seen in Apple. Behind this scene of success, there must be an interdisciplinary collaboration among the peer departments of product development, which requires successful communications. Therefore, we will like to know how our interviewees' companies are doing in this regard.

3.3.2. *The Design Process and Industrial Design Teams*

According to the collaborative and multi-stepwise nature of product development, a well-structured design process is required to govern certain flow of communications. Therefore, we will have to understand the design process of the interviewees' companies.

3.3.3. *Collaborative Design*

The trend of globalization had extended the process of product development far beyond national borders. This extension did not limited within one company, but also among collaborative companies. Such kind of product developing collaboration between organizations at scattered locations had made the issue of communications so crucial since it has become much more difficult than before. Therefore, we will have to know what our interviewees' companies are doing to enhance this kind of communications.

3.4. *Communications of Industrial Design Teams*

The interdisciplinary nature of product development and the fact that industrial design is only a part of the product development process both made communication destined to be a key of success for managing industrial design teams. This section explores the issue of communication of industrial design teams regarding its key skills, strategies, and roles:

3.4.1. *Key Communication Skills in the Design Process*

In this research, we set out to choose design managers of established and successful companies as our interviewees. Therefore, we can also assume that they all have an institutionalized design process in place. Although it will be difficult to make their design process revealed, however, we will have to find out the key skills that they are utilizing to keep their design projects go through the process smoothly.

3.4.2. *Communication Strategies in the Design Process*

As our interviewees are all design managers of successful companies, we can assume that they must have some useful strategies for dealing with the issue of communication in their design process, which are worthwhile for others to take as reference. Therefore, we will have to unveil the key strategies of this part from our interviewees.

3.4.3. *Communication Roles in the Design Process*

In the complex web of organizational communication in our interviewees' companies, we can assume that there are some instrumental roles which are working well enough to make product development projects keep on flowing more smoothly along their design process. Therefore, we will have to figure out what kind of communication roles do our interviewees deem as key factors of success in their product development.

4. **Conclusions**

Based on the summary of existing literature reviewed on the topic of communication in product design process in chapter three, we developed twelve questions to use in our interviews. They are as follows:

- What are the major ways and channels of inward communication in your company?
- What are the major ways and channels of outward communication in your company?
- What are the major ways and channels of outward communication in your company?
- What kind of product development process does your company adopt?
- What kind of positions dedicated for communication in product development does your design team have?
- How do your company hand down design tasks to your design team?
- How do your design team report the progress of their projects to your management?
- How do your design team conduct their inward communication in design?
- How do your design team conduct their outward communication in design?

- What kind of communicational problems do you usually encounter in your design tasks?
- Do you also encounter other kinds of communicational problems? What are they and how do you deal with them usually
- Do you have any more comment on our interview today?

We hope that this questionnaire will be able to help us elicit valuable experiences from successful design managers through in-depth interviews. Their precious answers will be our materials to analyze by the Grounding Theories Methodology in our subsequent research, to distill them into principles of communication in product development, which will be helpful for many other design managers to take reference for enhancing the effectiveness in communications of their design teams.

Furthermore, although the subsequent research is still going on and the final result is yet to report here. Nonetheless, this paper has made a comprehensive review and report on the literature regarding the issue of communication. Therefore, we hope that this paper can be a useful steppingstone for those who are in need of acquiring a better understanding of the knowledge of communication, especially in the field of new product development.

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