BREEDING DESIGN THINKERS

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Abstract

Knowledge comes before action and there can be no action without knowledge. Knowledge is worthless except, when they are passed into action" (Al-Quran; Muhammad 47:19). With the existing knowledge, it is a state of being active; the action will be transformed into new knowledge. By doing things, the body goes through the process of learning. This process of drilling the mind with repetitive exercises will internalize the action in the body. Therefore, there will be knowledge, experience and skills.

Interaction activities with human and human, human and man-made things, human and nature spark out new knowledge that is by learning the existence and how it was created. By doing this, the sense of awareness derives ideas to imitate, improve or create a new one. If we learn from man-made things, it is just an improvement, but if it is learned from nature and the environment created by God, it will be novel!

Keywords: explicit knowledge, design, tacit knowledge

Knowledge Category

Knowledge can be categorized as explicit knowledge and tacit knowledge. Explicit knowledge is knowledge of rationality. It is a readily codified and recorded somewhere. It is sequential and available in a tangible form. Explicit knowledge comes in the form of books, documents, databases and anything that can be understood tangibly. This type of knowledge is digitized, which means it can be changed and upgraded easily.

Meanwhile, another category is tacit knowledge. This knowledge resides in the individual mind. Tacit knowledge is acquired mainly from experience. Tacit knowledge is personal, context-specific and therefore hard to be formalized and communicated (Polanyi 1966). Recently tacit knowledge has become a hot topic among those who are interested in the new grounds of business competition. Following Drucker (1994), a great deal of work has focused that knowledge and learning are sources of competitive advantage. By studying a range of technology–intensive business,

Leonard-Barton (1998) shows how the knowledge is embedded in people; tools and practice can be developed within and sustains businesses. Nonaka and Takeuchi (1995) offered a model of organizational knowledge creation in which the socialization of individual, tacit knowledge drives a virtual cycle of continuous innovation. A different approach was taken by Edinsson and Marlone (1997), who developed novel constructs and measures for evaluating the hidden intellectual capital of organizations. Finally, Davenport and Prusak (1998) took a pragmatic approach to the foregoing, asking how firms can work effectively with knowledge – to create an environment in which knowledge can flourish and yet be brought effectively to bear on key decisions.

Accessing Knowledge

Explicit knowledge is well documented and organized. It represents a symbol type that gives context for knowledge upgrades. At present, with technology advancement, information is easily accessed through the computer as a tool. We are flooded with data and information. Our job is to filter the information to become knowledge. Explicit knowledge is expressed fairly easily using language or other forms of communication, visual and sound movement. Explicit knowledge is equivalent to information.

In contrast, accessing tacit knowledge has to be dealt with in different ways, because it resides in the environment, the social, the human and organizations. Tacit knowledge is an analogue form (Nonaka, Takeuchi 1995). This can be done by observing and studying the behavior closely and try to understand it. The process of accessing this knowledge is time consuming, but it is the best and first-hand knowledge. Tacit to tacit transfer includes such techniques as mentoring and on the job experience and apprenticeship. Its major drawback is that it results in transfer to only a small number of receptors.

Design Knowledge

The existence of design knowledge has been a part of human life. From product to process and the people. All of these serve as a whole integration of the design knowledge. There is a triangular relationship between the three areas.

Firstly, the relationship between people and product, the design knowledge will be aquiring are the lifestyle and the trend that looks into the study of form and the configuration of artifacts. Secondly, the relationship between product and process, the design knowledge will be acquiring are the process of design and the application techniques which aid the designer. For

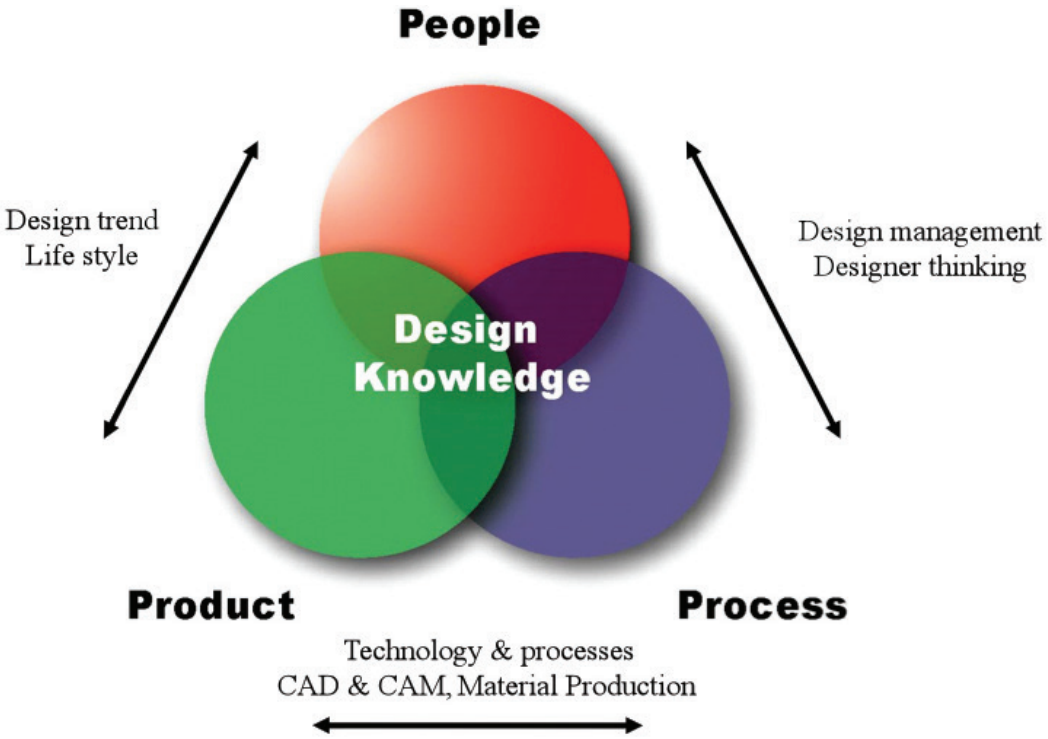

Figure 1: Acquiring Design Knowledge

example the computer aided design, computer aided manufacturing, machine and tools. Thirdly, the relationship between people and process, the acquiring design knowledge will be acquiring designer's ways of thinking and management practices. Therefore, design knowledge is more towards understanding the human experience which involved the conversion of tacit knowledge to explicit knowledge.

Design Thinking

Design thinking is the core creative process for any designer (Cross, 2011). Rowe (1987) stated that "Design Thinking" is a reflection on the "situational logic and the decision making process of designers. He highlighted the conception of design thinking in the field of architecture and urban planning. It has reached a stage where there is a need of understanding of how thinking goes through behind the process of designing. This eventually leads to the emergence between the understanding of design thinking and how ideas and solutions are formed and created.

Currently, the world is going through high demands of designers to have a flexible thinking rather than to follow a certain set of step or procedure. They may break the rules by thinking out of the box. Design students need to adapt to the changes in technology, the lifestyle and learn to appreciate and exploit them through creative thinking.

According to Lockwood (2009), essentially a human-centered innovation process that emphasizes observation, fast learning, visualization of ideas, rapid prototyping and concurrent business analysis are ultimately influenced innovation and business strategy. The objective is to involve consumer, designers and business people in an integrative process which can be applied to product, service or even business design.

Design thinking is now perceived as a way of problem solving (Rowe, 1987) and also considered as a mind-set and a methodology (Brown, 2009). Design thinking is applied not just about design problems, or solving engineering problems, but also solving on business and management problems. Design thinker is a person who is able to identify and solve a design problem with a structured or creative methodology by creating many options for improvement.

Knowledge Conversion Model for Industrial Design.

According to general perception, design is viewed as highly vocational skills. They are totally wrong!. Design is a high order thinking skills. They involve the critical thinking process as well as applying various design method in solving design problems. Designer model was classified into four types, designer as an imitator, designer as an apprentice, designer as a collaborator and designer as a thinker. The designer model in relation with design educational goal is elaborated below.

Designer as an Imitator

A young mind who is not affected by design experience, for example fresh student that embarked into design course will be given a complete opportunity to start a new experience without prejudice to any constraint or limitation. Designers are seen as imitative learners and the goal of learning is the acquisition of know–what. They repeat the behavior or appearance until success is achieved. This is to acquire the total skill by referring to the existing knowledge. Generally, in the lab or design studio activities are learned by practice, exercise and repetition. The example types, of course, are workshops, drawing skills and CAD training that involves hands on learning. This type of knowledge conversion is called explicit to explicit.

Designer as an Apprentice

The designer learns from instructive and excessive exposure. The designer should be presented with facts and principles, and rules to be learned, recalled and applied. They must have the capacity to acquire new knowledge by employing mental abilities. This is the acquisition of know – how. Generally, books, lectures, facts and principles are the learning activities in the lab or studio. The example of knowledge are design principle, history and manufacturing process. This type of knowledge conversion is from explicit to tacit.

Designer as a Collaborator

Designers are seen as a knowledgeable individual. They work with others as an associate toward a common goal. This is the act of attainment with negotiation and managing the design process smoothly. Furthermore, they are the manager of objective

Table 1: Designers' Knowledge Conversion Process.

Designer Model	Design Thinking Level			Knowledge Conversion	Education Goal	Teaching and Learning Activities Examples	Content Examples
	Undergraduate	Level	Postgraduate				
Designer as a Thinker	Year 4	High	Year 2	Tacit to Explicit.	Critical and reflective thinking for innovation, Care-why.	Discovery learning, journals, critiques, concept creation.	Degree project, experiment, design competition.
Designer as a Collaborator	Year 3	Medium		Tacit to Tacit.	Collaboration & negotiation, management, Know-why	Discussion groups, reciprocal learning, management.	Field research, interaction with user and producers, industrial training.
Designer as a Apperentice	Year 2		Year 1	Explicit to Tacit.	Acquisition of Know-how.	Books, magazine, internet, lectures, fractual and principles.	Design principles, history, manufacturing process.
Designer as a Imitator	Year 1	Low		Explicit to Explicit.	Acquisition of Know-what.	Learning by doing, practice, exercise, repetition.	Workshop, CAD Training, Drawing.

knowledge and they understand where the appropriate knowledge that is needed to be constructed and negotiated with others resides. Generally the studio activities will be group project, reciprocal learning and management. This is the acquisition of know-why. The example exercise is field research, interaction with user, producers and industrial training. This type of conversion is tacit to tacit.

Designer as a Thinker

Designers are seen as thinkers or intellectual being. The designer represents self-motivated creativity which consists of will, motivation and adaptability for success. The care-why people can simultaneously thrive the rapid changes and renew their cognitive

knowledge, advance skills and system understanding in order to compete in the next wave of advances (Quinn et al, 1996)

In the above model, there are four kinds of designers will be produced. The curriculum design should aim towards producing quality designer. However, the designer will go through all this learning stage in their three or four years of an undergraduate design course at the university. For example; designer as imitator is where explicit to explicit as the knowledge conversion objective can be focused to the first year students. They will gradually be assessed by a measured system as they are more mature to gain more complex on the higher level.

Meanwhile, in the postgraduate program, the intake of candidate normally comes from various disciplines in design and non–design background. Therefore, these groups should be exposed more to basic requirement of knowledge and skill in design where the curriculum goal should be geared to designer as an imitator and an apprentice in the first year. In the second year the curriculum should aim at higher levels to develop designer as a collaborator and thinker through the research project program. The table shows the distribution matrix of designer model objective and year as a guideline concept for industrial design curriculum development.

Conclusion

The principles of knowledge are shared in teaching and learning because the knowledge is tacit and explicit. The interaction of both tacit and explicit leads to innovation, therefore the driving force of the knowledge conversion process itself has to be human to human, their senses and stimulation, their routine practices to assimilate knowledge and environment for knowledge interaction. The care–why learning concept will develop an interpersonal concern and care about human needs. They will try their best to accommodate design ideas into reality for the benefit of humankind. Knowledge intensive is coming on strong and design thinking is the engine of the new economy, the brain based economy and the idea based economy.

The important aspects of knowledge conversion in industrial design is the process of transformation and the activities that require conversion manners, namely explicit to explicit, explicit to tacit, tacit to tacit and tacit to explicit. These attitudes will be the basic typology to correlate with the curriculum structure, control mechanism, standard and policies. By understanding these factors, it will help the top management to plan a total strategy for knowledge conversion process especially in dealing with designers. In order for organization to succeed, there should be a mixed of practices where tacit knowledge and explicit knowledge merged together. As a comparison, design process creates values in designing products; meanwhile knowledge conversion process creates values in knowledge. Therefore, values in knowledge are powerful weapons for designers in the competitive battle forever.

Accumulation of academic experience at the university will not be enough, but the understanding how to upgrade his owned design knowledge is vital. This is because learning is a continuous process as long as we live. A learning designer is skilled at creating, acquiring and transferring his knowledge and modifying its behavior to reflect new knowledge and insight. They are the DESIGN THINKERS!

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