Persuasion Knowledge Transfer: A Conceptual Model

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ABSTRACT

Researchersare fully aware that the transfer of specialised knowledge to designer is important. This demand is especially high within the growing domain of persuasive technology that requires designers to grasp persuasion knowledge in order to design product, application or services that able to change peoples' attitude and behaviour. Therefore, this study aims to explore ways on how persuasion knowledge can be transferred and used during the design ideation stage. The literature analysis method was used to analyse the important persuasion elements involved in persuasive design. It become the basis of the conceptual model of persuasion knowledge transfer in inspiring the persuasive design ideas during the design process.

Keywords:Persuasive technology, persuasion knowledge, knowledge transfer.

I. INTRODUCTION

Specialised knowledge referred to specific subjects, and the implementation of these subject matters in other domains could be troublesome. Although it is challenging, transfer of thespecialized knowledge is important for bridging different discipline closer.

A. The importance transfer of specialised knowledge

Designer is commonly referred to people whoinvolved in product design activities. Most designer is well trained with know-how knowledge (technical and design skill). This know-how knowledge is incredibly important as it is necessary in designing product or application as well as able to differentiate designer's competency and expertise in specific design area. In contrast, academic research communityis commonly referred to people who focused on knowledge production(Zimmerman, Forlizzi, & Evenson, 2007). This knowledge is usuallyfocused on development of fundamental science and theoretical aspects for specific subjects. The subjects would become specialised area when it is applied in other knowledge domains.

Persuasion is a specialised knowledge that has being practised in various knowledge disciplines. Recently, the use of persuasion is growing in importanceespecially in the design of interactive application. For examples, users has using an online dietarywebsite tolose weight and change their dietary behaviour(Saperstein, Atkinson, & Gold, 2007), a smoking cessation website has helped smokers quitting their smoking habits (Escoffery, 2004) and children wastrained to manage their asthma by using an online game (Liebermen, 2001). These applications utilised the theory and principles of persuasion both explicitly and implicitly in order to influence people to behave as intended. The success of persuasion is highly depended on the suitability or correct use of persuasion knowledge thatbeing implemented in the application.

The availability of persuasion knowledge that suits in the design process is very crucial to ensure the knowledge is correctlyapplied, and the influence process is happening. The importance of having complete understanding about persuasion knowledge before applying to specific designrelies on the fact thatthe theory or principlescan later be applied to similar situation or test onvarioussettings. This practice will benefit both persuasion and interactive/technology knowledge discipline. Therefore, the knowledge transfer from knowledge community todesigner community is necessary. However, knowledge transfer is a challenging issue for both research community and designer community.

In investigating this issue, this paper is exploring a way that knowledge can be transferred from one community to another community in the following three sections. The first section will touch upon how specialised knowledge of persuasion is important to be transferred to the designer, state of the art of persuasive technology knowledge and its limitation. The second section, we are proposingourconceptual model of persuasion knowledge transfer to designers, and work that has done so far. The final section will touch on the future work in our research and summary of the work in progress.

B. Example of Successful Story of Knowledge Transfer (Ergonomics)

Ergonomics knowledge is anexample of specialised knowledge that really close to designer.Ergonomic knowledge is drawn from various fields in human science and technologies,which involved among others the design of everyday equipment to improve working posture, system and computer that easier to use, working environments to suit the needs of users, and the tasks performed.

Ergonomic concerned with 'the job must fit the person' in all respects, and the work situation should not compromises human capabilities and limitations(Whitfield & Langford, 2001).For years, the professional agronomists actively working between design and user production system that highlighted where the area of ergonomic is important(Dul & Weedsmeester, 2008).They were also working in various domains an applying the ergonomics knowledge to enhance the situation during that time. As resultsof these massive efforts, ergonomics today has become one of the important design factors and stood out as a recognised body of knowledge. The available resources of ergonomics are outstanding and exist in form of:

(i) ISO standard guideline in many disciplines such as ICT, health care standard, health and safety standard, transport standard and manufacturing standard,
(ii) The company style guidelines that conformed with standards of industrial sectorsand but not limited to,
(iii) Designers' education program and professional certification, offers by various higher-level institutions around the world to educate designer regarding human factors and ergonomic.

These handful resources serve as references for people and organisations from variousdisciplines. Access to ergonomics knowledge is made easily,thus has encouraged knowledge sharing and dissemination. Therefore, in approximately 60 years, ergonomics becomes one of the fastest growing domain knowledge with international association in more than 40 countries(Dul & Weedsmeester, 2008).Drawing from this situation, knowledge transfer from one society to another is possible and can flourish into something extra ordinary.

C. Growing Area of Persuasive Technology

Generally persuasive technology is defined as any interactive product that designed to change attitudes and behaviours (Fogg, 2003). Recently persuasive technology popularity has increased drastically and applied in various knowledge disciplines such as health, marketing, advertising and education, which suggest the steady growth of this field.

Some of the examples of persuasive technology are illustrated in Figure 1. (i) *The Baby Think It Over* infant simulatoris a life-size baby doll with realistic computerized responses, which allow teens to experience some of the demands of infant care. It is being used by schools and other organizations to help adolescents appreciate the responsibilities involved with parenthood(Somers & Fahlman, 2001). (ii) 5-A-Day Adventures, is a multimedia program to encourage kids to eat more fruits and vegetables (Fogg, 2003). (iii) Wii Fit a game from Nintendo that designwith the combination of fun and fitness to motivate and encourage users to exercise. (iv) '*Customer brought these items also brought this'* function in Amazon website,offerssuggestions for customer to buy related product that they have or intend to purchase. These are only few examples and there are more out there, which indicated that persuasive technology has become a medium for influencing people and an essential new area of study.

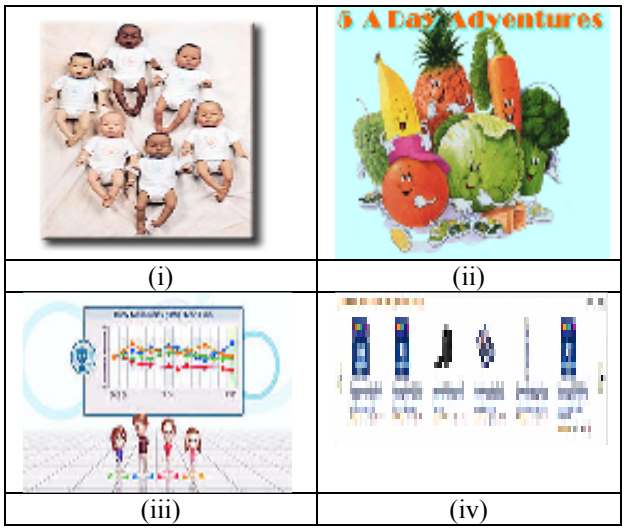

Figure 1. Example of Persuasive Technology Artefacts

D. Persuasion Knowledge

As a comparison with ergonomics, persuasive technology also requires knowledge of the real world (such as psychology, persuasion, and sociology) to be used in the design process. However, the diversity of this knowledge requires designers to filter and choose which persuasion knowledge is important in design.

In order to understand further about persuasion, we were exploring the persuasion knowledge to make itsuitable during the design process. In this exploration, few situations wereperceivedas follows (figure 2):

(i) Persuasion has become sub knowledge in various knowledge discipline communities such as health, politics, marketing, and social,
(ii) Each community is using their own version of persuasion knowledge in fulfilling their needs and objectives.There is no obvious intra communications between communities in exchanging knowledge of persuasion, which might be useful to other communities, and
(iii) The outsiders (people from outside the community) are preferred to refer to each specific community for acquiring persuasion knowledge to fit into their own purposes.

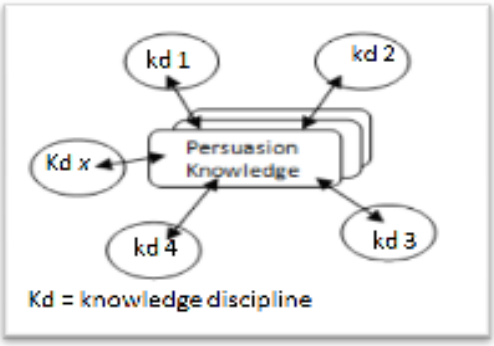

Figure 2: Persuasion Knowledge Exploration

Therefore, these situations haveraised the following questions:
(i) How persuasion knowledge is view from designer's point of view?
(ii) How outsiders (designer/non-specialist) tap into the persuasion knowledge?
(iii) How the knowledge is transferredand use by the designer/non-specialist?

As persuasion gradually becomes important in guiding the creation of many interactive products, knowledge about it should be easily accessible to designer (non-specialist). The transfer of this knowledge to designer's community now is necessary to ensure that the persuasion elements aretakenseriously into design consideration.

II. PERSUASION KNOWLEDGE TRANSFER

Transfer of persuasion knowledge requires a competent understanding on how the knowledge can be used and its affect towards the design. Therefore, transfer of persuasion knowledge demand extensive exploration in various disciplines.

A. Efforts in Persuasive Knowledge Transfer

Researchers are aware about the need for transferring persuasion knowledge to designer. The effort in bringing the knowledge closer to the designer of persuasive technology is pioneered by BJ Fogg. He presented the persuasion knowledge among others in forms of model, approach and strategies of persuasion in an interactive context domain (Fogg, 2003). Then other researchers starts to follow his paths such as PSD(Oinas-Kukkonen & Harjumaa, 2008) and Design with intent (DwI) that generating persuasivedesign idea using cards methods(Lockton, Harrison, Holley, & Stanton, 2009).

Today, as persuasive technology has evolved into everyday products, a proper knowledge transfer is necessary to the designers (non-specialist). The use of persuasion that aims to alter people's behaviour might later turns into something extraordinary. We urge that more efforts shouldbe brought forwards, and promote that persuasive design is not just new fashion, but it is increasing the important design factors for user engagement and change.Therefore, we insist ontransferring the persuasion knowledge to the designers. This knowledge could provide insights and theories to the designer who could:
(i) engaging persuasion knowledge into a more dynamic persuasive design process,
(ii) enrich and expend the persuasion theory and knowledge, and persuasive technology respectively and
(iii) apply appropriate persuasion strategy in the application and product design.

B. Proposed Approach of Persuasive Knowledge Transfer

Based on this scenario, we aim to create a model of persuasion knowledge transfer from persuasion knowledge community to designer community. It is our theory that it is both possible and necessary to developa way of transferring from the source knowledge community to designer in an effective and timely way which still maintaining its richness where appropriate. We believe, designer who has clear understanding on persuasion knowledge would design a better persuasive product/application.

This posses us with two main challenges: (1) what knowledge will be needed by designer (while not all knowledge is appropriate) and (2) how the persuasion knowledge should be given to designer in a way that is suitable for them and fit in their working practice.

C. Appropriate Persuasion Knowledge for Designers

In order to understand what knowledge *will be needed by designer (while not all knowledge is appropriate)*in designing any persuasive product or application, we were examined literatures which gathered from numerousknowledge disciplines that

related to this interest. These literatures then were analysed and organised properly to reveal in depth about persuasion knowledge used in prior researches. The list of persuasive technology related researches were gathered through the online databases. The keywords such as 'Persuasive technology', 'Persuasion through ICT', 'Theory based Persuasive Technology' and 'Persuasion and technology' were used either in single or combination phrases. The selection of literature is based on the following criteria:

(i) The research used behavior change theory to guide the development of behavior change intervention.
(ii) The research used the interactive technology as medium or tools for influencing behavior change in its intervention.

The gathered literatures were mostly in the health-related domain, some in communication, and others in politics and marketing. The analysis were done by indicating most frequent persuasion knowledge elements that have been used in the design of the persuasive technology. Presumably,the most observed elements represent the important and appropriate persuasion knowledge that can be implementedinthe design and development of interactive application.We were suggesting that designers need to grasp the following persuasion knowledge that presented in table 1, during the design process..

Table 1: Summary ofthe Appropriate Persuasion Elements

No	Elements of Persuasion
1.	Strategy/Principles
2.	Techniques/Tactics
3.	Target Behaviour (attitude change, behaviour change)
4.	ICT medium (use context, approach)
5.	Persuasion level - The level of persuasion would in individual or society level.

*Strategy.*Persuasion strategies or principles are the most items discussed in order to influence people. Generally strategy is the overall planning(Kvana & Candy, 2000)and a dependent variable (people's behaviour determinants)(Michie, Johnston, Francis, Hardeman, & Eccles, 2008)of the persuasion attempts. The strategy can be dividedinto two major classifications; individual persuasion strategy and social context strategy. The individual persuasion strategy isbasically overall plan of the persuasion attempts that utilises the individual's behaviour to trigger the change. Although there are lots of behaviour determinants in each individual, the most used are motivation, knowledge, skill, affection (emotion & trust), and message(Michie et al., 2008).

In contrast, social context strategy focused on the use of social cues to change people behaviour and attitude (Reeves & Nass, 1996)(Smith, Barash, Getoor, & Lauw, 2008). There are numbers of social contexts that able to influence people in social environment such as social presence, social roles, social interaction, social content, social learning and social support. A number of researches have proven that social context strategy able to influence people's attitude and behaviour(Cialdini, 1993)(Toscos & Faber, 2006). Numbers of theories have explained in detailed that social context (subjective norm), able to put pressure of changes as some people may be prone to change as other people preferred for those changes (Bandura, 1986)(Fishbein & Ajzen, 1975). Therefore, persuading people using social context strategy may worth a try.

*Technique.*Some researchers interchangeably used the terms of strategy and techniques. On this study, these conceptswere separatedto allow better understanding. Techniques were definedas the persuasion processthat carried out toinfluence people. A similar definition was given by Kvana and Candy (2000), which specify techniques as definable steps that drawn from reliable information and experience.Techniques serve as the independent variable that able to influence people(Michie et al., 2008), which suggest that it can stand on it's own. However, to allow better perspectives, this study has grouped the techniques according to the specific strategies that seem appropriate. For example, if the persuader planning the affection persuasion strategy, he or she may use techniques such as fear, happy, guilt in order to influence people.

Table 2: Persuasion Strategy and it's example techniques

Strategy	Techniques
Motivation	Reward
Knowledge,	Providing information, feedback.
Skill,	Simulation, rehearsal, self-monitoring, goal setting, tunnelling.
Affective or Emotion	Guilt, fear, happy
Message	Tailored message, credibility.
Social context	Liking, scarcity, testimonial, suggestion, social support, social comparison.

*Approaches.*The context of persuasion approach in computing knowledge discipline(Oinas-Kukkonen & Harjumaa, 2008) can be drawn in two main approaches; computer-mediated persuasion (CMC) and human-computer interaction (HCI).CMC is a way of communication in the virtual world. There are

lots of applications such as email, bulletin board, forum, video conferencing, voice over protocol (VOIP)that eases communication regardless of time and geographical boundary(Gualdano & Cialdini, 2002). For example, today's people using email and video conferencing to engage or joint into a specific discussion that may expand their knowledge and skill. Current trend of research shows that these tools have been used to persuade others to engage into intended behaviour, increased team performance and productivity(Ehsan, Mirza, & Ahmad, 2008).

Persuasion in human-computer interaction requires designer to formulate persuasive design into application/system interface, or creating persuasive interaction that able to persuade users to perform the intended behaviour (Fogg, 2003). In this approach, the persuasion is done intentionally with its specific persuasion strategy that being embedded into design of technology, artefacts or interfaces (Fogg, 2003). Without a doubt, research into this area does provide rich knowledge in the persuasive technology domain.

Persuasion's Level. The discussion of persuasion usually falls into the individual and social level. Additionally, there are also manytheories, especially in social-psychology theory, communication and sociology that explain about people's change and behaviour accordance to this context. The individual level usually explains individual human attitude that can be manipulated by designers. On the other hand, the social level involvesthe involvement of other individuals or groups in the persuasionprocess. It is important to use appropriate theories and level of analysis to present the best solution for specific situation (Jr. & Viswanath, 2002).

Target Behaviour. Whilst some researcher focus the target behaviour (Fogg, 2003)(Lockton et al., 2009) in terms of the observable actions that can be measure, we on the other hand viewing target behaviour as aninfluence process.Therefore, target behaviourswere grouped into three influence processes that were observed occur repeatedly in many researches.

(i) Thinking (UT) is the influence process for people who do not aware of their condition. In this stage, design should focus on changing people's awareness and curiosity. Although the changes in thinking are not necessarily followed by any action, the change in the mind-set is very crucial.
(ii) Learning (UL) isthe influence process that concentrating on how a designer should 'teach' user before taking any action. Learning will provide a user with significant experience to ensure that changes make would be long-lasting and with confident.
(iii) Action (UA) is a process that influencesusers to take a measureable action. Design in this stage requires fully understanding on user engagement and simplification that encourage users to act.

Target behaviour should become the most important element in designing persuasive application. In the design process, designers can choose one or combination of thistargetbehaviour and designs accordingly.

D. Conceptual Model of Persuasion Knowledge Transfer

Persuasion knowledge needs to be understood by designer, it indeed rich and complex hence requires clear categorization. Therefore, based on the appropriate persuasion elementsextracted from previous researches, we are illustrating the conceptual model of persuasion knowledge to be transferred to designer.

Figure 3 illustrated the diagram of persuasion knowledge transfer.This model enables designers to understand the important point in persuasion knowledge as well as demonstrate to designers the way of thinking in breaking the complex of the persuasion knowledge to be applied in design of persuasive application.

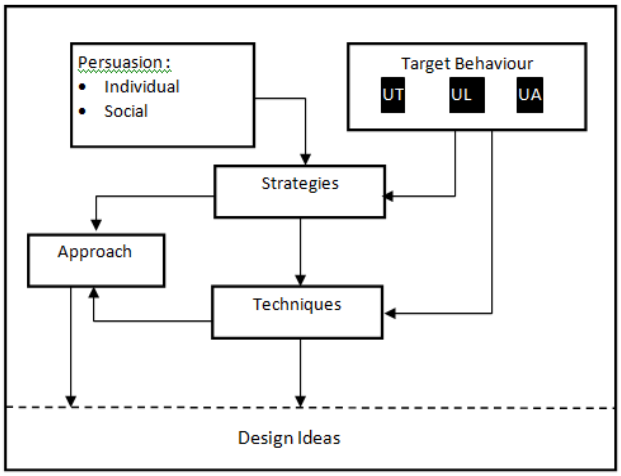

Figure 3: A Conceptual Model of Persuasion Knowledge Transfer

This model suggests that designers should start with choosing the appropriate target behaviour in planning the persuasion. This might involve one or combination of the target behaviour for specific purposes. Level of persuasion also needs to be determined either in individual or social level point of view. Based on this, designer could work on range of persuasion strategies that categorized into the level

respectively. This could reduce the exhaustive persuasive information that might come in and let designers focus on the appropriate one. On the other hand, having the range of persuasion strategies allow designers to have a broad view before making any decision. Then on each strategy, there are selections of techniques that might be appropriate for the specific persuasion attempt. Designers also could think of which approach is suitable to carry out the intended persuasion attempt. Ultimately, the *persuasion knowledge transfer model* aims to assist designers in inspiringthe persuasion ideas during design ideation stage.

III. FUTURE WORK AND SUMMARY

This section will explain regarding the future work in this research and how it shapes this exploratory study.

A. Future Work

The next research stage is to take our second challenge of *how the persuasion knowledge should be given to the designer in a way that is suitable for them and fit in their working practice*. There are two important research activities will be conducted during this stage: (1) Interview with designer and (ii) design workshop with designer.

The objective of interviewing designers will provide researchers with rich data about the design process, how designer design, how they accessed and usedthe non-design knowledge (persuasion), and how this knowledge affects the design. Meanwhile, the design workshop aims to capture and understand the design activities. This workshop would help us understand the design process and how non-design knowledge (in this case persuasion knowledge)affect overall designer's experiences in the design process.

A. Conclusion

In persuasive design, specialised knowledge of persuasion is important in order to design product or services that able to influence people's attitude and behaviour. Although there areattempts in transferring the persuasion knowledge to designers, theefforts are still limited.We believed that persuasive technology fields would grow immensely and become an important specialised area. Therefore, it needs a way of transferring its complex and rich knowledge to the practice community.In our study, we have illustrated a conceptual model of persuasion knowledge transfer that can help in assists designers with this challenge.Additionally, we are also hoped that this effort will contribute in providing designer with more dynamic of persuasion knowledge that appropriate for his/her design purposes and bridging the gap in transferring complex knowledge from knowledge community to designer community.

REFERENCE

Bandura, A. (1986). *Social Foundation of Thought and Action. A Social Cognitive Theory*. New Jersey USA: Prentice Hall.

Cialdini, R. (1993). *Influence: Science and Practice*.Harper Collins College Publisher.

Dul, J., &Weedsmeester, B. (2008).*Ergonomics for Beginners: A Quick Reference Guide* (3rd ed.). New York: Taylor and Francis Group.

Ehsan, N., Mirza, E., & Ahmad, M. (2008).Impact of Computer-Mediated Communication on Virtual Teams' Performance: An Empirical Study.*Engineering and Technology*, 694-703.

Escoffery, C. (2004). Development and process evaluation of a web-based smoking cessation program for college smokers: innovative tool for education.*Patient Education and Counseling*, *53*(2), 217-225. doi:10.1016/S0738-3991(03)00163-0

Fishbein, M., &Ajzen, I. (1975).*Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research*.Addision Wesley.

Fogg, B. J. (2003). *Persuasive Technology: Using Computer to Change What We Think and Do*.San Francisco USA: Morgan Kaufman.

Gualdano, R. E., &Cialdini, R. B. (2002).Online Persuasion: An Examination of Gender Differences in Computer-Mediated Interpersonal In uence.*Group Dynamics: Theory, Research, and Practice*, *6*(1), 38 -51. doi:10.1037//1089-2699.6.1.38

Jr., J. R. F., &Viswanath, K. (2002).Communication Theory in Health Behaviour Change: The Media Studies Framework. In K. Glannz, B. K. Rimer, F. Marcus, & L. Jossey-Bass (Eds.), *Health Behaviour and Health Education: Theory, Research and Practice* (3rd ed., pp. 361 - 388). John Wiley Imprint.

Kvana, T., & Candy, L. (2000).Designing collaborative environments for strategic knowledge in design.*Knowledge-Based Systems*, *13*, 429 - 438.

Liebermen, D. A. (2001).Management of Chronic Peiatric Diseases with Interactive Health Games: Theory and Research Finding.*Ambularoty Care Management*, *24*(1), 26 - 38.

Lockton, D., Harrison, D., Holley, T., & Stanton, N. A. (2009).Influencing Interaction: Development of the Design with Intent Method.*Persuasive 09* (pp. 1 - 8).

Michie, S., Johnston, M., Francis, J., Hardeman, W., &Eccles, M. (2008). From Theory to Intervention: Mapping Theoretically Derived Behavioural Determinants to Behaviour Change Techniques. *Applied Psychology An International Review*, *57*(4), 660-680. doi:10.1111/j.1464-0597.2008.00341.x

Oinas-Kukkonen, H., &Harjumaa, M. (2008).Towards Deeper Understanding of Persuasion in Software and Information Systems.*First International Conference on Advances in Computer-Human Interaction*, 200-205. Ieee. doi:10.1109/ACHI.2008.31

Reeves, B., &Nass, C. (1996).*The Media Equation*. California USA: CLSI Publication.

Saperstein, S. L., Atkinson, N. L., & Gold, R. S. (2007).The impact of Internet use for weight loss.*Obesity reviews : an official journal of the International Association for the Study of Obesity*, *8*(5), 459-65. doi:10.1111/j.1467-789X.2007.00374.x

Smith, M., Barash, V., Getoor, L., &Lauw, H. W. (2008).Leveraging social context for searching social media.*Proceeding of the 2008 ACM workshop on Search in social media - SSM '08*, 91. New York, New York, USA: ACM Press. doi:10.1145/1458583.1458602

Somers, C. L., &Fahlman, M. M. (2001). Baby Thinks it Over. *Journal of School Health Volume 71, Issue 5, pages 188–195, May 2001*, *71*(5), 188 - 195.

Toscos, T., & Faber, A. (2006).Chick Clique : Persuasive Technology to Motivate Teenage Girls to Exercise.*Self*, 1873-1878.

Whitfield, D., & Langford, J. (2001).Ergonomics.*The Ergonomic Society*. Retrieved 2010, from http://www.ergonomics.org.uk

Zimmerman, J., Forlizzi, J., &Evenson, S. (2007). Research Through Design as a Method for Interaction Design Research in HCI design research in HCI. *Human-Computer Interaction*, (Paper 41). Retrieved from http://repository.cmu.edu/hcii/41/