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Knowledge Transfer as a Precursor to Product Development: A Pakistani Industrial Perspective

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Scholars and researchers have been studying various dimensions of knowledge transfer (KT) since last two decades. This knowledge transfer between individuals (inter-individual) in an organization is further segregated into two dimensions; tacit and explicit in this research, has received lesser attention relatively. This research concerns the evaluation of the relation of knowledge transfer with new product development (NPD). Knowledge transfer is an independent variable which is further divided into two parts; knowledge transfer by codification (KTC) and knowledge transfer by personalization (KTP). In this research a survey was carried out through questionnaires among the managers of the firms which were involved in innovation. The analyses were done in PASW 20 in order to check the reliability and validity of data. Regression analyses were done to obtain the results. This research will contribute by analyzing the impact of knowledge transfer on the development of new product.

Key words: Knowledge Transfer, Knowledge Transfer by Codification, Knowledge Transfer by Personalization, New Product

1. INTRODUCTION

Knowledge and technology (Technological Knowledge) has become exceedingly competitive in recent corporate world. Economies of world are heavily relying upon the latest knowledge which is available in the form of new technology. Many Asian economies and developing countries are exploiting knowledge in order to get the competitive edge (Liao and Hu, 2007). It has become the growing interests of business firms to use the available knowledge in an innovative way and introduce improved products and processes. Researchers and scholars, all over the world have studied the use and reuse of knowledge in creation of new product. Knowledge transfer is a part of knowledge management which has grasped the attention of organizations. Knowledge transfer is the key to knowledge integration which is primary concern of firms (Grant and Baden-Fuller (2005) (Grant, 1996). Different studies have proved the relationship of inter-individual knowledge transfer and organizational performance positive, but our concern in this research is to evaluate the relationship between knowledge transfer and product development.

According to Nonaka (1994) the knowledge is of two types; tacit and explicit. Explicit knowledge is a public good in nature which is based on universally accepted object. It can be coded and transferred easily. Tacit knowledge is encoded and un-codified knowledge which solely belongs to a firm and personal possession of firm. Tacit knowledge is complex in nature and hard to transfer and interpret. There, however is lack of research on interpretation, inter-firm transfer and reuse of knowledge (Madhavan and Grover, 1998). Previous researches relate the tacit knowledge with the capabilities of firm. A very little work has been carried out to test the impact of transfer of tacit knowledge from one firm to another in the form of mutual collaboration (Inkpen and Dinur, 1998). Henderson and Clark (1990) demonstrate how triumphant firms incorporate new technology into the existing technology through several lines of products. New product development (NPD) has therefore become a chief strategic movement among most of the firms since new products contribute progressively more significant part to the sales and specifically the profits. Nonetheless, product development has comparatively extensive timeframes and is thought to be more unstructured, volatile and has been found hard to manage and measure. This can be attributed to the technology transfer which has been shown to boost economic growth, technological capabilities, innovation and performance, increased productivity, a competitive advantage and especially towards the local industry development. This research assesses the influence of Knowledge on the development of new product. The survey was conducted to gather the data from different kind of industries located in Lahore, Pakistan. Hypotheses were constructed and a theoretical framework was developed to analyze the results of survey.

Literature Review

Knowledge Transfer

Knowledge transfer has been found to be a critical aspect in reference to the act of creating knowledge. APQC (1999) found its significance in influencing knowledge for superior organizational performance. In examining the best observation which firms carry out to expand a culture of knowledge transfer APQC

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reinforced the connection between business strategy and knowledge transfer. And how does this link fall fit with the whole of organizational culture and the leadership along with how it sets well with social and human networks and in the context of institutionalization of knowledge disciplines. There have been recorded three chief reasons that exist for the transfer process and itself the knowledge transfer. Huysman and Wit (2004) enlisted them as knowledge acquisition, knowledge creation and knowledge reuse. These essential factors are highly vital for the process of knowledge transfer. The researchers also figured out the important aspect of social capital which is certainly connected with management of knowledge. The social capital is destined to be acquired utilizing social networks with an intention to generate opportunities.

A significant factor in obtaining organizational competitiveness is the aptitude to successfully transfer knowledge. Earlier studies designate the differences residing between transfers of knowledge and sharing of knowledge. Transfer implies a meeting point, a comprehensible objective, and precise uni-directionality while sharing is suggestive of significant directionality; devoid of a detailed objective (Argote and Ingram, 2000). New knowledge arises as a result of an amalgamation of tacit and explicit knowledge. Reed and DeFillippi (1990) describe tacitness as an implicit, non-codifiable accretion of skills which results as a consequence of learning-by-doing. Tacit knowledge is therefore defined by them as the kind of knowledge transfer, unable to be effortlessly shared and communicated and is extremely private and individual. Apart from this it is profoundly embedded in action and inside an involvement of an individual contained by a definite context. In opinion to tacitness, Kogut and Zander (1992) argument that combined ventures shift markets fundamentally because of the requirement to reproduce experiential knowledge which is not easy to seize. Such a transfer is not exclusive of challenges and problems. For a case in point, in the perspective of hybrid organizations, the researchers emphasize the influence of tacitness over the unsteadiness of assistance by mentioning that agreements of technology transfer, whose rationale is the substitute of tacit knowledge and skill, lean to smash down more frequently than the ones including the switch over of technology that can be formalized.

Knowledge Transfer by Personalization (Tacit Knowledge)

A key factor defined by Polanyi (1967) that is progressively being taken into consideration; in most of the knowledge treatments is the function of tacit knowledge. This is the knowledge which is personalized; it cannot be elucidated completely by a specialist and can be relocated from a single person to other merely. This is possible through an elongated progression of apprenticeship. Polanyi stated that in his famous maxim, "We know more than we can tell," signaling the happening where most of the factors that comprise of human skill remain unexplained, unarticulated and known solely to the person who owns that particular skill. Many other researchers have looked into the idea, realization and scope of knowledge that is tacit in origin. Zuboff (1988) illustrated tacit knowledge in their study in a detailed manner and defined it as a skill which is action-centered and embodied as well. He elucidated that the tacit knowledge is dependent upon action-centered skills since they are profoundly developed by means of actual performance, i.e., learning by doing. This type of knowledge transfer has been primarily originated and developed at the individual level; however, with the passage of time and progress in study it has been increasingly recognized and acknowledged for its existence in the organization grounds in addition.

Knowledge Transfer by Codification (Explicit Knowledge)

Distinct to the tacit knowledge, the other kind of knowledge transfer is the explicit knowledge. This one is fairly convenient when it comes to articulating and communicating the transfer process that occurs between the individuals and the organizations. Explicit knowledge is situated in the locale of textbooks, formulae, and/or technical documents. Zuboff (1988) in his study declared this aspect of knowledge as intellective skills which are found embodied. Here in this framework the intellective skills merge explicit reference, abstraction, along with the procedural reasoning. This makes them undoubtedly presentable in the form of symbols which is without any difficulty transferable. Kogut and Zander (1992) differentiated between information based on facts and the knowledge linked in term of organizing the factories. The record of ingredients in a set of instructions consisting of information here in this circumstance is an inadequate representation of the knowledge required thereof. This too falls under the framework where the theme of knowledge transfer is mediated without the elucidation of action-centered steps.

Product Development

Henderson and Clark (1990) demonstrate how triumphant firms incorporate new technology into the existing technology through several lines of products. New product development (NPD) has therefore become a chief strategic movement in most of the firms since new products contribute progressively more significant part to the sales and specifically the profits. Nonetheless, product development has comparatively extensive timeframes and is thought to be more unstructured, volatile and has been found hard to

manage and measure. This can be attributed to the technology transfer which has been shown to boost economic growth, technological capabilities, innovation and performance, increased productivity, a competitive advantage and especially towards the local industry development.

Product Development in association with Knowledge Transfer

With an intention to maintain competitiveness, organizations constantly innovate in ideas and particularly in terms of technology. Social networks have been found to ease the process of knowledge transfer within the organizations. This occurs by means of the improvement of network links that lie among units. This horizontal, highly significant transfer of knowledge expands the learning process at organizational level that results in innovation (Tsai, 2001). Nevertheless knowledge is tricky to multiply through special units inside an organization where relationships between business units that are pre-existing stay absent. This recommends that in order to promote organizational innovation, knowledge and information should be intentionally disseminated by means of IT systems (being structured channels) as well as the systems of social network. The latter's enclosure underlines the significance of face-to-face dealings for transfer of tacit knowledge instead of solely relying over the structured, IT networks for organizational improvement (Szulanski, 1996).

2. RESEARCH METHODS

Hypotheses

Based upon the above discussion the hypotheses are constructed that show positive effect of knowledge transfer on the development of new product. Both types of knowledge transfer (knowledge transfer by personalization and knowledge transfer by codification) will have positive impact on new product development.

Impact of Knowledge Transfer (KT) on New Product Development (NPD)

Hyp1: Knowledge Transfer by Codification (KTC) is positively associated with New Product Development (NPD).

Hyp2: Knowledge Transfer by Personalization (KTP) is positively associated with New Product Development (NPD).

Hyp3: Knowledge (KT) is positively associated with New Product Development (NPD).

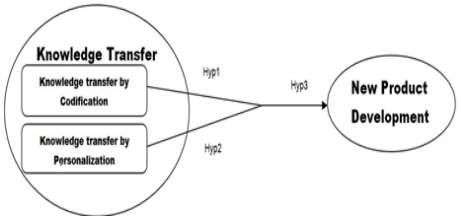


Figure 1 A proposed theoretical model for impact of knowledge transfer (KT) on new product development (NPD)

3. METHODOLOGY

In order to assess the results of hypotheses the research was designed. The data was collected from Pakistani firms. A random sample of 200 firms was selected from the list of industries located at industrial estates of Lahore. The target respondents of survey were the persons of managers or directors cadre. The persons were contacted personally and the survey questionnaires were distributed. There were 143 complete surveys during 3 months and the response rate was yielding 71.5 per cent. Out of 143 only 129 questionnaires were usable for study which was yielding about 64.5 per cent of total number of respondents. The organizations were categorized into eight types of industries. These organizations were involved in new product development and had collaborations with other firms. .

Research Instrument

To measure the variables and their construct the survey was constructed after extensive literature review. The respondents were to rate the items which were based on five-point Likert scale ranging from strongly disagree to strongly agree.

Knowledge Transfer

Knowledge Transfer has two construct; Knowledge Transfer by Personalization and Knowledge Transfer by Codification. These two constructs were measured independently.

Knowledge Transfer by Personalization and Codification Measurement

Three questions were selected to measure the knowledge transfer by personalization and four were adapted to measure codification knowledge. These survey items were partially adapted from (Dixon, 2000), (Nonaka and Takeuchi, 1995), (Bhatt, 2001) and (Alavi and Leidner, 2001).

New Product Development (NPD) Measurement

Two items were used to measure this variable. One was selected from (Doz, Olk, and Ring, 2000) and one was adapted from (Tsang, 2000).

4. ANALYSIS AND RESULTS

First of all the items of each variable were assessed using the item Total correlation and Cronbach's Alpha coefficient in order to know the reliability of the items. Table 1. is summarizing the values of items' constructs. All constructs have >0.7 values which is the cut-off level set for research (Nunnally, 1978) Table 2. is indicating the correlation values of the constructs which were measured by using Pearson correlation coefficient. The value of coefficient determines the strength of the relationship. The directions of the variable and their constructs are positive which means an increase in the score of one variable will positively affect the other. The relaionship value between NPD and KTP is .326 which is the lowest among the variables but medium in

nature. According to Cohen (1998) variables having r value from .30 to .49 are of medium correlation while . 5 to 1 are highly correlated. There is a strong and positive correlation among knowledge transfer (KT) and its construct knowledge transfer by personalization (KTP) [r=.824, n=129, p<.001 (double asterisk after the coefficient)], knowledge transfer (KT) and its construct knowledge transfer by codification (KTC) [r=.829, n=129, p<.001], new product development (NPD) and knowledge transfer by codification (KTC) [r=.694, n=129, p<.001] and new product development (NPD) and knowledge transfer (KT) [r=.740, n=129, p<.001]. They are highly correlated with each other in poitive.

Multiple standard regression analysis was run keeping KT (including its constructs KTP and KTC) as independent and NDP dependent variables. Table 1. shows that the independent variable constructs (KTC and KTP) have correlation with dependent variable (NPD). The values of correlation of KTP and KTC are r=.326 and r=.694 respectively which shows a considerable correlation with NPD since correlation value is not less than .3 which is cut off value. But KTP is showing lower bonding than KTC however we retain our entire variables.

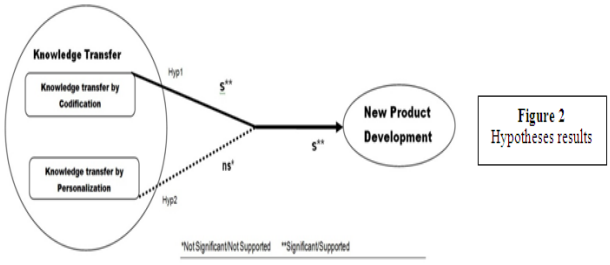


Figure 2
Hypotheses results

Fig. 2 is depicting a snapshot of hypotheses results after statically analyzed.

The cutoff points for multicollinearity presence in case of VIF (Variance Inflation Factor) is above 10 and Tolerance is less than (Tabachnick and Fidell, 2001). In our study value of both the constructs of independent variable KT, have Tolerance and VIF values of .86 and 1.154 respectively. Tolerance point is less than similarly VIF point is not greater than 10 as shown in Table 2. So we can say that our data is free of multicollinearity.

In order to get the unique contribution to prediction and variance of independent variables to dependent variable we analyze the Part values represented by Table 2. KTP's Part value is .001 and KTC's Part value is .083. The percentage value of KTC is 69.3 which is an indication variance in total in NPD. KTP has very less considerable percentage so the contribution is very low in comparison with KTC.

Beta value is the indicator of the contribution of independent variable to explain the dependent variable. In our study the Beta value of KTC is .895 which means that KTC makes the stronger unique contribution to explain NPD. KTP has lower beta value which depicts low contribution in explanation of NPD. The Sig. value of KTC is less than .05 (0.1, 0001 etc.) it means it makes unique contribution to the prediction of NPD. KTP's Sig. value is greater than .05 i.e. (.97>.05) which means that KTP is not making significant unique contribution to the prediction to NPD. The R Square value is taken to assess the variance in dependent variable (NPD) by Model including KTP and KTC. In our study the value of R Square is .799 which is 77.9 per cent which means that our model explains 79.9% fit in new product development as shown in **(Table 1, 2).**

The results of analyses show that all variables i.e. KT, NDP and constructs of KT (KTP and KTC) are reliable factors according to Cronbach Alfa values. All variables are positive correlated however KTP has medium but positive correlation value. Through regression analysis we come to know that KTC has positive and strong bonding with NPD than KTP which has low but positive bonding. KTC has high percentage and highly significant in unique contribution predictor and variance. So from the summary of results we deduce that our hypothesis (Hyp1) which states "Knowledge Transfer by Codification (KTC) is positively associated with New Product Development (NPD)" is highly supported because KTC has highly positive effect on NPD. While (Hyp2) "Knowledge Transfer by Personalization (KTP) is positively associated with New Product Development(NPD)" is not supported well because KTP is insignificant to NPD especially in these firms. Hyp3 "Knowledge (KT) is positively associated with New Product Development

Table 1. Result summary obtained from SPSS Analyses

		Person correlation									
Model	**Variables**	**NPD**	**KTP**	**KTC**	**Tolerance**	**VIF**	**Part**	**Beta**	**sig**	**No of Items**	**a (cronbach Alpha)**
R square	KTCa	0.69	0.37	1	0.866	1.154	0.833	0.895	0.00	4	0.817
0.799	KTPa	0.33	1	0.37	0.866	1.154	-0.001	-002	0.97	3	0.765
	NPDb	1	0.33	0.69						2	0.85

'Knowledge Transfer contructs:''New Product Development (outcome)

a. Dependent Variable: NPD

b. Predictors: (constant). KTC. KTP

(NPD)" is fully supported because of overall positive impact on NPD.

5. DISCUSSION

The results of analysis shows that a significant correlation is existing between KTP and KTC this is because of common factors to drive individuals to share and seek knowledge from each other irrespective of their source and intention for knowledge transfer (Kumar and Ganesh, 2011). Another observation noted by Haas and Hansen (2007) that these two type of knowledge transfer are not exclusive mutually but they may be taken concurrently by individuals for sake of knowledge from colleague. One type of knowledge sharing may lead to another one e.g. one accessing the document for reading may ask colleague and that colleague may give a useful tip about the existing knowledge. So this result is supported by literature. If an organization treats KTP and KTC being strategically independent, dependence always exists and both of them foster and help in growth.

Table 2. Correlation Coefficient Matrix
Correlations

	KTC	KTP	KT	NPD
KTC Pearson Correlation	1			
KTP Pearson Correlation	366"	1		
KT Pearson Correlation	829"	824"	1	
NPD Pearson Correlation	694"	326"	740"	1

**correlation significant at the 0.01 level (2-tailed)

The regression analyses are showing different picture which suggests that KTC is stronger predictor of NPD than KTP. KT by codification is more capable in development of new product. One reason for this may possible that people in surveyed organizations are reluctant to share their knowledge with each other and they are willing to follow the given procedural outlines by organization. This result is partially contradicting with the literature because (Kumar and Ganesh, 2011) comment that collaboration and sharing is a necessity for product development because design and development of new products do not follow the structural and well defined problems and solution of NPD are not ready made. NPD certainly requires creativity and invoking process. At other hand literature also suggests that reuse of existing or previous design knowledge is involved in engineering design activity and in addressing new product development problem (Lyer, *et al.*, 2005). Existing or depository-based knowledge transfer is not unnecessary in new and innovative product development. Knowledge transfer can be regarded as an effective mean to creativity and hence give an opportunity to get competitive advantage for Pakistani Industry. Knowledge transfer seems difficult but the formation of alliances, adapting capabilities and skills can facilitate learning and trust development over time. The findings of this study suggest that tacit knowledge should be encouraged among the employees through good communication and development of trust culture. The management should play vital role and pay special attention to the use and sharing of experience in development of new product. The personalized knowledge should be used to develop codified knowledge in the organizations. The codified knowledge should be updated and replaced time by time using the experience of the skilled employees. This will develop the sense of creativity and rotation of new knowledge in organizations. Training sessions and workshops should be designed and conducted in order equip the employees with new knowledge. All employees should be encouraged to bring up new ideas and suggestions. Introduction of latest technologies in organizations help in knowledge transfer.

6. CONCLUSIONS

The paper is a report on Knowledge Management in context of new product development. After literature study we came to know that there have been no in-depth work has been taken place in Pakistan. A detailed recommendations and suggestions were noted by (Soderquist, 2006) to create an organized and structural relationship of knowledge management with the product development projects by the firms. Previous researchers have linked the knowledge development with product development in term of knowledge creation process and innovations. So this paper has a little contribution in research of knowledge transfer pertaining to product development. This study suggests that KTC has higher importance than KTP in NPD. The organizations in Pakistan should develop forum for addressing problems faced by them regarding knowledge management at inter-organizational level. Rapid changes in technologies are helpful in knowledge sharing.

The factors used in our study were based on existing research findings. The rapid change in business environment may cause change the factors we used in this study. In future the qualitative data could be used for survey study and analyses and also include other type of industries in the study as sample. A comparison study could be conducted to complement the findings of this study. Cultural difference might be another different factor since this study was carried out in Pakistan. Pakistan's culture, business environment, organizational structure and HR practices are different than others. Further studies could use other factors as mediator and moderator to test the results it could be a different approach.

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