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# Considering Document Workflow Issues: Pros and Cons for the Non-experts

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## Abstract

There is an increasing amount of documents in today's businesses, phenomenon particularly accentuated in the new-centric organisations. In this paper we examine the core principles of what constitutes a basic system processing the flow of documents in such an environment. Gradually, we introduce the modules that build up the relative systems and the respective parameters including technical specifications and the human element. Furthermore, we examine the merits of the using a document workflow system, the issues that arise and potential measures to tackle with potential emerging difficulties.

**Keywords:** Document Workflow, CSCW, Human interaction

## 1. Introduction

### 1.1 Getting to know the concepts

One of the most important tasks in today's business world is the management of the mass amount of documents generated throughout the course of operations. Equally, it comprises a key variable in producing cost-effective and optimal results from augmented workload (Marcheritti, Tesconi & Minutoli, 2005). Handling documentation is vital considering that at many instances there are different organizational participants working in separate sections of the organization and they need to fill forms, reports etc reflecting their particular tasks and responsibilities. Considering that the process of generating documents can be concurrent, there is a requirement for efficient mechanisms to handle the flow of documents in order to guarantee the smooth operations in organizations (Alder, Nash and Noel, 2006).

Making an attempt to define workflow in an organisation, it can be viewed as a the automation of a business process, wholly or partly in which documents, information, tasks etc are passed from one participant to another for action according to a set of rules based on prescribed procedures (Krishnan, Munuga, Karlapalem, 2001). As an extension of this definition, a document workflow or DW refers to the corresponding automation and processing of the relevant document through collaborative effort with the actual document being either the objective or a part of this endeavour.

### 1.2 Document Workflow sequence

Figure 1 illustrates the backbone document workflows principals. At the first level we have the various authors that contributed written pieces of work, information and other data. All the documents are inputted in a central database where depending on the architectural tenets and the relevant permissions other authors or prescribed editors can then view, edit and process the documents. The outcome of the input and processing of the documents as we denote in this case is a finalized published document. Essentially, the entire process is automatised through the use of the enabling technology as per the definition of the document workflow.

At the introductory stage, the various authors input the documents in a digitized form in a PC that is linked with the rest of the system depicted in figure 1. There are several ways to input the information either directly in an electronic format or through a capture device such as a scanner, a multifunctional printer or a copier depending on the content and the expected results the author requires from the conversion process (Simske & Arnabat, 2006). Understandably there is relevant enabling software to propel the procedure and basically automate the flow of the documents (Marcheritti, Tesconi & Minutoli, 2005).

The functions performed in through the software include actions such as uploading and storing the documents in a shared space where it can retrieved by other users or editors for reviewing and further processing. Examples of such technologies enabling the operation of workflows include commercial products such as Microsoft Sharepoint (Microsoft, 2006), web-enabled technologies or a hybrid mix.

In the utilisation of the technical feature, essentially there are several actions that take place on the document either from the human element that manipulates the document through the software or by the automated agent that is

programmed to process in a form the document (Marchetti, Tesconi & Minutoli, 2005). Examples could include an author that logs into the site to retrieve a document placed there by another member of a group and transmit it to another member. Equally, an example of a software agent that performs automated functions could include splitting the document and sending bits to various members of the group and merging different documents from various authors (Marchetti, Tesconi & Minutoli, 2005).

The whole routing of documents is performed in a structured and set manner with clearly defined rules at its stage which is the base for architectural principals when designing a relevant system (Marchetti, Tesconi & Minutoli, 2005; Wang & Kumar, 2005). Essentially in the workflow, every person of group is responsible to carry out a prescribed task, the in sequence the software informs and passes on to the person who is responsible to carry out the task assigned to the next stage. For example, in figure 1 above an author places a document into the system for the editor to proofread and then once the editor has completed his reviewing, the software forwards it to the publishing section of the organisation.

Although figure 1 is simplistic it also serves an illustration of an important element in the flow of the documents through the organisation, the collaboration between the various parties that interact. We could consider for example author 1 and editor/author 3. The first writes a paper, digitizes and inputs in the system. Sequentially, author 3 acting as an editor logs in the database and accesses the document, reads it and edits it. Once these steps are completed, the document is inputted again in the central database where the end result is the published document. These sequential movements through the aid of the computerised system represent a simple collaboration between author 1 and author/editor 3.

The same relationship equally exists for the rest of the authors and editors in the same environment. It worthwhile noting that this collaboration takes place through the utilisation of an computerised system, basically the same technical approach used to automise the flow of documents. This type of collaboration is often termed as computer supported collaborative work (CSCW) and at its simplest it refers to designing and using computer systems to support the collaboration among people (Ellis et. al, 1991; Grudin, 1991;Schimdt & Bannon, 1992;Hutchins, 1995). The collaboration that evolves inside the routing of documents is an integral piece of the system not only as a function but also a philosophy that is embedded in every part of the document flow.

### *1.3 Multi-level document workflow sequence*

In figure 2, we can see a graphical representation of the sequence of a document workflow within a publishing environment. At the first level, author 1 inputs a document into the system and stores it in the central database. Intelligent agent represents the agent that automates the procedures essentially the software that is utilised for this purpose. The intelligent agent as explained is the technical enabler and the various actions are precisely the automated steps within the workflow.

As such, in the illustration, author 1 inputs a document in the system through the intelligent agent which is denoted by action 1. Following, the agent sends the document to the central database of the system (action 2) and then that is forwarded to the editor for review (action 3 & 4). Continuing the sequence, the editor once he has completed the reviewing process and sends through the intelligent agent the document back to the central database (action 5&6). Finally again through the intervention of the intelligent agent, the document is dispatched to the publication section for publishing (action 7&8).

Naturally the relationship inside the operations of the system can vary as for example the editor might require alterations to the document and therefore send it back to the central database from where the system will notify the author to make the changes necessary and resubmit the document. The later would of course lead to a set of additional actions multiplying the total operations of the intelligent agents in the workflow. Additionally by placing in the picture other authors there would be a relevant increase in the layers of the workflow or even create new workflows by inputting different documents etc in the system.

With regards to the intelligent agents that essentially adjust the route of documents in the system, Marchetti, Tesconi & Minutoli (2005) offered a purpose orient classification defining the as external and internal. External agents role can be fulfilled either by human or software and is attached to the process of a specific workflow whilst internal agent operations are embedded into the system and are useful for the execution of any workflow. Applying this categorisation in the earlier illustrations, author 1 is an external agent for this particular workflow as he inputs the original source for further processing into the system. On the other end, the intelligent agents in the illustration are the ones responsible for performing functions (e.g circulating documents, informing editor etc) necessary for the materialisation of any workflow.

Simulating figure in a real-time publishing environment (e.g a newspaper) a journalist utilizes some technological means to digitize an article he has written and place it into the main database of the newspaper. The flow of

movements, from the beginning the author commences an interaction with the system as for example using a PC connected to the intranet of the newspaper of using his home PC to access the web and send the article by e-mail the sequence of actions commences and essentially the flow of the documents inside the newspaper. As explained earlier, the intelligent agent denotes the technical facilitator both in terms of hardware and software to automate the process of document circulation. Naturally, the intelligent agent is not restricted to one computer or the use of the web as it can be a dedicated system to managing documents unique to the newspaper.

We can note the flow of the document as it progresses to the new stage once the journalist has placed it inside the central database and then the editor log on to access the article for inspection. Once the editor completes his scrutiny over the submitted piece he places his observations which could include remarks for revision by the author, corrections made on the spot by the editor or if the document is fine, the direct approval for publication. In the first instance, the article is inputted into the system and the journalist is notified to access the document, see the remarks of the editor and make the necessary adjustments. Again we can see the role of intelligent agents in enabling the flow of document from author the editor and if need be again between them, a sequence that leads to up until the publication stage. It is worthwhile pointing the auxiliary functions in a real-time workflow environment such as the communication between the parties (e.g via e-mail) and broad access for example using a mobile internet connection.

It is worthwhile illustrating the differences between figure 1 and 2 in both in terms of design and functionality. First of all, figure 2 describes a considerably more complex situation as we have a more detailed break-down of the various interactions between the involved parties (author, editor etc). Equally, in figure 2 we introduce the technical facilitator, the intelligent agents that automate the flow of documents. As pointed, the intelligent agents essentially is the engine to succour collaboration between the various people in the newspaper not only by being the medium to move the input back and forth but also to allow for the input to be processed at certain stages (e.g the editorial stage) while all the time, enabling communication and internal information exchange.

Further from the degree of complexity in the relationships between the interacting parties, figure 2 also depicts in more detail the functional characteristics of a document workflow sequence. As in a real-time situation there are many functions involved from the introduction of the article in a digitized format to its final publication. This particularly important in comprehending the role of the intelligent agents in the sequence and also the particular functions involved at its stage. The latter is extremely useful when having to design a relative system or even upgrade the existing one with new feature that will enable more necessary functions. Equally, by mapping down the functions in the sequence there can be the appropriate monitoring to guarantee the smooth running of the system and intervention if need be to avoid bottlenecks.

## **2. Workflow Management Systems**

### *2.1 WMS in retrospect*

As it was mentioned above, document workflow is an integral and essential part to the daily operation of organisations. The technical materialisation of the flow of documents can be termed as WFMS or Workflow Management System that essentially is comprised by the software used to support the automation of the business processes. Certainly, document processing is not the sole functionality of a WFMS but an important function nevertheless. (Bae and Kim, 2001). Interchangeably, we could use the term document management system which essentially embodies all the aspects pertaining to document administration and handling and thus WFMS is an integral part of it (Sprague, 1995).

With the advent of the internet and the expansion of web technologies there has been a significant pursuit of digitisation of the older paper-based workflows and a movement towards digitised document imaging, storage, distribution and overall document management system with companies reaping significant gains (LaCava, 2003; Computer Weekly, 2005; Fall 2005).

Essentially, we have the necessities of the document route inside an organisation as expressed by the features of the document system and on the other end, the web technologies partake the role of an enabler to accomplish and supplement these features. The advantages of using a combination of web-succoured Document Management System converge to a significant degree with the requirements mentioned earlier. For example, the large available space on the internet allows the management of large amount of materials; it provides access to the user from remote places with a compatible interface and navigational mechanism. In such a fashion, the flow of documents and information becomes easier, faster and more approachable to users (Balasbramania & Bashian, 1998; Aversano, Canfora, De Lucia & Gallucci, 2002; Dustdar, 2005).

Drawing a connection thus far, in generic document workflow structures we notice a level of resemblance but also some additional elements that arise. Again we have the various agents both human (author, editor etc.) and software,

the various actions that take place between the agents and all are filtered to heart, the DMS which is similar to the central database used in the introductory figures in the sense of acting as a repository of the interaction for all the agents in the workflow but further from that here it enacts, co-ordinates and processes the interactions between the parties. Further novelties of this schematic approach are the introduction of the web as a motion platform for the flow of the documents with online applications such as the link checker and the full-text indexer. Lastly, we have enriched the role of human elements introducing the role of a technical team that supports and administers the relevant interface providing to the authors the structure of product information (i.e layout, electronic format etc) using templates

We can notice the interaction between the author, editor and the new entity introduced in this figure the legal department that also is a part in a workflow system in a newspaper for reasons of copyright check, permission to reproduce etc. In figure 2 earlier we denoted the various interactions as actions, here we have the title for each one. For example creates an article, logs it into the system and then accesses it in order modify/update it after the editor's instructions. A new characteristic we can see here is that the author can also notify the editor about the submission status of the document and vice versa. The repository of the flow, the main database which is inspected and maintained by the technical staff again displays the interactive relationship between the contributing parties as they place the revised or edit document inside the database and from there follows the relevant communication (e.g notification to the author for changes or publication) similar to what previously seen in figure 2. The main functional difference is the use of the web in the publication stage as the supplement to the native DMS of the newspaper.

We have already pointed the technical difference with the use of text-formatting tools but is also worth stressing the difference in the architectural structure with introducing the web. Earlier, in figure 2 we only had a native Document management system with all the functions incorporated. Here we have two additional layers, the staging and the production web. Especially the staging web is an area where all the members of the flow can preview the document and from the beginning it is submitted right before publication. An important characteristic is this capacity is not incorporated in the main database but it makes use of the common workspace provided by the internet which enhances the ability of journalists or editors to collaborate more efficiently and over distances. Lastly, this feature enhances the total outcome in terms of quality as it permits to preview the finalised form of the document before it is publicised and to make if need be any modifications for the article to conform with the standards both content and in style.

The increase in demand for web-based applications in document workflow and digitations of the former paper-based systems gave a significant boost in the commercial applications of WMFS. Equally popular is the Microsoft Sharepoint server application that provides features for the collaborative management of the document workflow.

Definitely, some organisations have more enhanced needs of document management than others. For example, organisations in the news industry such as newspapers, news agency and other mass media related entities have a greater bulk of documents that can be in any sort paper-based, electronic or web-based that need to be managed effectively. As a rational consequence, the use of document workflow systems is bound to have a significant impact on the particular field and improve significantly the flow and processing of documents inside such organisations.

Essentially, the implementation of a document management system to handle the load of documents, images and data and the necessary flow among the various divisions and parties in an organisational setting. The advantages are obvious in terms of improving the collaboration within the setting and improving performance (Catton 2006; Dustdar, 2005). As mentioned earlier, in information and document intensive domains such as newspapers both conventional and online, the flow of information is an essential and integral part (Smeaton et. al 1998; Castells et. al, 2005).

## *2.2 Collaborative writing in a workflow environment*

An essential part of the course of documents inside an environment and particularly in the news-intensive settings it the ability to produce collaboratively authored or edited documents. As we can derive from the majority of the illustrations, the process of inputting data, text, images etc inside the document management system further from the actual procedures it involves collaboration of the members / users aided by automisation that occurs. For example in figures 1 and 2 earlier a paper may be collectively written from scratch, or pass through a series of revisions and editing as it moves through the hierarchy of an organisation.

Support may be for synchronous collaborative writing at a distance, where two authors discuss and revise a document as they would be sitting together at the same desk, even though they are many miles apart. The style of drafting and redrafting where different people work on the document at different times requires asynchronous collaborative support. As an integral part of the document workflow, several benefits are attached with the

collaborative side of authorship. As noted in literature benefits could include (Bacon, 1990; Bogert and Butt, 1990; Cross, 1994; Forman and Katsky, 1986; Haley, 2001; Nelson and Smith, 1990).

- The production of enhanced quality in the output of the documents due to the broadened elements the users bring into flow

- Increased levels of overall motivation as members often will support one another to perform their best in their contribution.

- The participation and observation of co-writers in the early stages of the document compilation (i.e draft stage) is possible to provide valuable comments improving thus the timeline of the overall processes.

- Less experienced and novice writers can exploit the opportunity of working with more senior colleagues thus the work relationships within the organisation will be strengthened and the final documents could have a higher acceptance rate due to the joined effort.

Looking further into the collaborative writing segment of the document workflow we can see there can be several modes of co-operation among the users. For example, referring to figure 2, the users might be working simultaneously on the same document (e.g author 1 placing the document into the system and the editor reviewing at a synchronous mode the document). Equally, the mode can be asynchronous with the members working towards their part in the system at different time periods (Lee, Narayan & Chan, 2000). The alternating modes of collaboration through the mediation of the system further to its advantages also create some issues that need to be addressed both technical and social.

Primarily, when a document is either co-authored or edited by different members it is likely that several parts will be modified and regenerated. It is essential therefore that any CSCW system adopted needs to support consistency both by allowing access to the involved authors but also in terms of avoiding bottlenecks due to system latency or break downs. Further to system parameters the role of the users is also important. Colen and Petelin (2004) argue that it is possible when users have different writing styles, conflicting perceptions about varying issues which could make them negatively responsive to other authors in the group that generate work based on such ideas creating thus internal difficulties in the total outcome. Certainly this goes further from a system adaptation but is an important example on the role the participants and their interactions can play in the final outcome produced. Nevertheless, there are some important features within the collaborative writing environment that extend to the total functionality of the document management system.

First of all there must be a two-way view of the document, one perceiving the document as whole and one focusing on specific parts of it. In such a fashion it is possible for users to discuss about various observations or changes that are pertaining either to the total body of the text or to specific parts of it. Quite often, writers are used in specific working environments such a particular word-processors and are more at ease when using this environment. In order not to disrupt the sequence of the flow and keep the quality and a certain standard, supporting varying such environments could be considerably beneficial.

Equally important, the various participants either authors or editors should be aware or have some information on the degree of completion of the other participants appointed tasks. This is a quite important feature, as real-time information is essential for an ongoing collaborative environment as it would allow for communication to also be in alignment with the expectations from the system whilst building an overall team-spirit. At the same time we should not discard to the possibility for the system to enable co-operation at various levels of the document circle. For example, should an editor discover some omissions or need for alteration at an early stage by exchanging information with the author or intervening himself can make whatever adjustments are necessary at the current stage saving thus time in the later stages of the document flow.

### *2.3 Issues in collaborative author systems: Emphasizing communication*

In the hybrid mix, with the utilisation of technology both internally with the native DMS and with the utilisation of the internet as pointed, collaboration becomes more enhanced and the capabilities of participants in achieving optimal result are more pronounced. As noted in earlier, the document workflow relies essentially in a combination of the technology used to automate the flow in the organisation and the people interacting with each other through the system to produce the final outcome, essentially the published document. As a consequence, in order for the DMS to function properly the human factor must be adept with the system's features, appreciate its usefulness and maximise its potential. The latter essentially assumes two important themes. First of all that the system is not complicated and as user-friendly as it is attainable without comprising it operations. The second theme involves that successful utilisation of the system by its users which is more complicated as people's individual characteristics, perceptions and opinions are mixed together creating a rather complex setting.

In theory, a document management system might indeed hold all the potential it promises and can significantly improve the total output both in terms of quality, quantity and time. Nevertheless, whilst the technical specifications



can be considered relatively constant, the human factor in practice can vary. In our case, in a computer-mediated collaborative document might encounter practical difficulties (Dillon, 1994). Essentially this area stresses the human side on a collaborative environment and the ability of the hardware used to support and co-ordinate the collaboration to actively stimulate and support the process. This is an important consideration not solely for the co-authored documents but for the entire document management system design.

In order to facilitate the smooth collaboration among the different participants in the system the architecture needs to overcome hurdles pertaining not only to technical bottlenecks but also issues such as author conflicts, real-time and active discussion on the various topics that arise in the various stages of the document's flow. Working towards that path, it is essential to provide the opportunity and if possible the indirect stimuli for communication among authors and editors in this environment which would allow to augment to overall background for collaboration. Certainly this does not imply the disruption of the system as it is necessary for the document flow to go forth the existence of a movements with grounded rules as mentioned in the beginning. Nevertheless, the later does not preclude the existence of additional features in the system that without burdening or impeding on the procedural steps to enhance the collaborative spirit of the participants.

Table 1 recaptures the main issues in the last sections and offers a series of recommendations for future directions in the document workflow pathway.

In the same context, another important element that should be considered in the human factor is precisely its unique characteristics. People are very often afraid or sceptic about changes and new technologies (Slack et. al 1998; Bartol & Martin 1999). It could be the case in the use of collaborative author tools and for the whole of the document management system. People might not be able to comprehend the use of the system or not appreciate its usefulness or even being afraid that the automation might eventually make their work redundant. There are quite many factors influencing the behaviour of people and all are especially subtle. The definitive issue is that without the open contribution of the human element, the DMS at the very least will not achieve its anticipated targets.

### 3. Conclusion

It is vital not only for the system to incorporate user friendly features but also to cultivate a necessary collaborative culture in the human factor. Adopting strategies of openness, explaining thoroughly the specifications and positive outcomes the system can produce would be a outlet to nourish the proactive nature of people towards the DMS. The same could include some additional training and seminars to introduce all the technical capabilities and increase trust both to the system but also to one another. A combination of technical orientation approachable to the average user and the cultivation of a collaborative culture to succour the use of the system could provide a working solution to surpass the arising difficulties.

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Table 1. Document workflow, current and forward course

Proponents	Current course 1	Current course 2	Future
DMS	Automating tasks in the flow of document	Allowing interactions between participants from the beginning to the end	Exploitation of the internet as the source for common workspace and communication
Technical Specs.	Allowing communication between participants in the flow, providing auxiliary functions	Providing enhanced effectiveness of D.M.S in total and of the people using the system	Security issues Making use of mobile technologies
Human Factor	Integral part of the D.M.S	Issues in regards to use of the system and communication with other members	Need to embrace technology and of increased motivation to become more adept in its usage.

Figure 1. Basic structure of Document Workflow principals

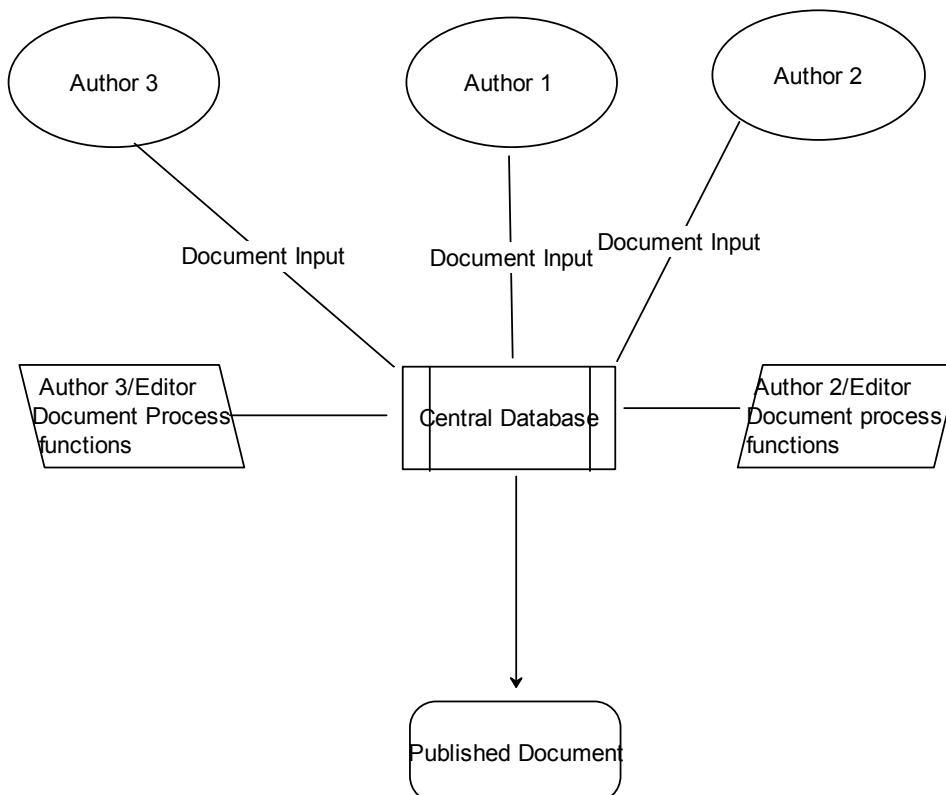
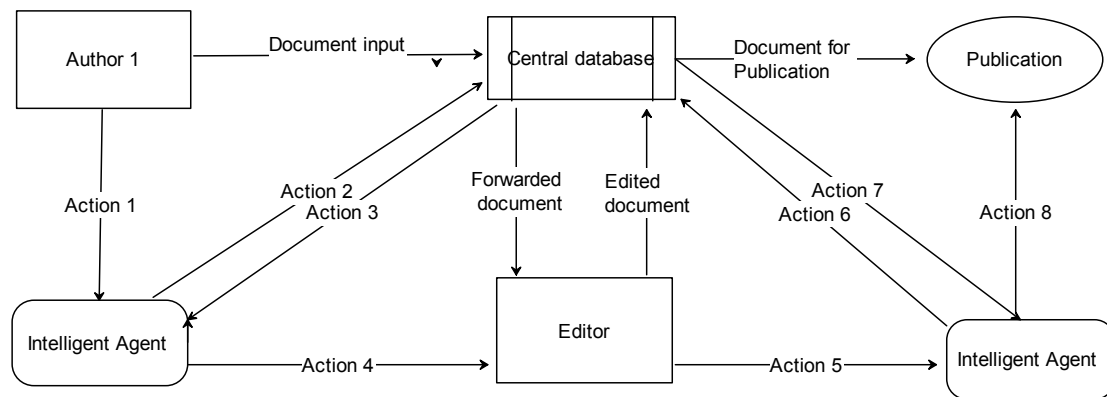


Figure 2. Document Workflow sequence



# The Impact of Computers and Associated Technology on the Teaching and Learning of Business Statistics at the University Level

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## Abstract

This article explains how recent changes in the teaching & learning business statistics are influenced by the increased use of computer and its associated technology. This paper also attempts to illustrate on how the pedagogy associated has also undergone a major transformation due to computers.

**Keywords:** Computers and associated technology, Business Statistics, Teaching & Learning

## 1. Introduction

Statistics as a discipline is an offshoot of Mathematics and has existed for many centuries. In schools and in universities it continues to be one of the subjects which are often considered to be difficult by students who try to avoid it. Statistical concepts are sometimes complex, abstract and involve laborious computations.

But the way statistics is learnt and taught has undergone a paradigm shift since the advent of computers. With the advent of first computing devices and eventually introduction of computers and related technology has changed the entire approach with which Statistics is being taught and learnt these days. Of course there are some advantages and disadvantages associated with the increased usage of computers in teaching and learning of Statistics but overall its use has lead to better understanding and handling of the discipline.

## 2. Impact on pedagogy

Advantages of using computers in teaching and learning Statistics definitely outweigh the disadvantages. One of the few disadvantages that come to mind is that more and more students are getting over dependent on computers even for the simplest of the computations. What once seemed logical has now been replaced by sophistication. This dependence leads to a student not grasping the technique(s) employed in reaching a particular solution. In my opinion the beauty does not lie in the correct solution but it lies in the process which leads to that solution. Computer oriented solutions more often than not ignore the process part of the solution. This is because the process is carried out in the CPU (central processing unit) of the computers. That is why it becomes imperative for teachers to give hands on experience to students on calculating problems manually as well, even if it takes more pain and time to do the same. This will also help in understanding on how the formulas are derived and how they differ from one situation to another and also on how the formulas can be adapted in unique situations. In the next sub-section I explain the recent changes and developments in the computer related technology that has affected the teaching and learning pedagogy of statistics.

### 2.1 Text Books

In recent years Statistics text books come with a CD Rom full of exercises, their solutions and data files. These data files can be used by the students to play around with and this aids learning by doing. Advent of computers has not only helped students but also teachers as it has become a lot simpler to teach and a lot more practical. The CD Roms which come with the text books often have MS PowerPoint slides with them and one can easily adapt those slides to suit his or her own teaching requirement. They are also appended with sufficient number of files full of data which could be easily used to play around with by students and teachers alike. This helps save a lot of teachers' and students' time in search of real life examples for analyses purposes.

### 2.2 Statistical Packages

Many applications have hit the market since the advent of computers. Their use in the classrooms gives students an opportunity to play with the real data. Fortran, Lotus 123 etc were some applications which were very popular

during nineteen eighties and early nineties but with the introduction of MS Office (MS Excel, MS Word, MS PowerPoint, MS Access) in 1995 provided the user with a very friendly software. MS Excel in particular has proved to be the friendliest of all the applications available in the market for statistical purposes. SPSS, Minitab, LISREL, Systat, Stataquest etc are some other packages that are used for statistical computations. Each of these software have their own positive and negatives and have different degree of ease with which they could be used. MS Excel and SPSS are widely used packages used in the universities. They are user friendly and cost-effective at the same time. Apart from this it is much easier to explain many concepts with the help of computers which otherwise need a very elaborate manual solution. Solving a Linear Programming Problem (LPP) is a good example. It would take a long time to solve a LPP by way of Graphical Method or by Simplex Method. But MS Excel-Solver solves the same in a matter of seconds once the problem is correctly formulated.

### *2.3 Research*

Advent of computers and related technology has helped researchers and their research work by manifolds. What used to take months and years in the early twentieth century and ever before could now be achieved in a matter of a few days and weeks. As Statistics is the study of collecting, editing, analyzing, compiling and presenting data. Use of computer has improved the quality of each one of these steps significantly.

Using internet one can send questionnaires and collect responses from potential respondents spread across the world (Prabhakar 2005 & Walker & Prabhakar 2006). The ease with which questionnaires can be filled-in and sent back using computers has undoubtedly improved the response rate. This has collection and comparison of data from different parts of the world much easier. Computer helps in analyses of data too. With a click of mouse one can create beautiful charts and pictorial presentation of data. Examples are many including regression analysis, correlation, trendlines, pie chart, bar charts etc. Business management students in particular stand to gain from these features as they would need these skills to function effectively once they join a management position at the completion of their studies.

### *2.4 Modeling*

Research in social sciences involves the evaluation of one or more models that have been developed based on theory that propose relationships among some or all of the variables in the model. Models help bring theory close to reality.

Modeling helps represent the abstract concepts in more understandable form. Computing technology has helped the field of modeling in a tremendous way. Simulations on computers have made modeling much easier and interesting. Factor analysis has lead to the technique of structural equation modeling which is made possible using a statistical package known as LISREL (Linear Structural Relationships).

Sample size requirements for SEM are generally based on the rule of thumb. A sample size of 100, 200, or even more subjects is considered good enough to deduce certain logical conclusions. (Boomsma, 1982; Marsh, Balla & McDonald, 1988).

Although models are generally based on data but for the sake of understanding, below I provide an example of the Structural Equation Modeling in the context of the factors mentioned in this article and their interrelationship and effect on success in teaching and learning. In an empirical research the path coefficients would also be indicated on the arrows.

### *2.5 Statistics online and interactive programs*

It is commonly believed that customary methods of teaching statistics to students are not very effective (Yilmaz 1996). There are numerous websites dedicated to interactive learning of statistics. Some of these websites have a solution engine that does the analysis part once you put some data in the boxes provided. Therefore in effect those are real time data crunchers and are instant solvers. There are many paid websites which help students to learn in a tutorial mode using a username and a password. Also there are downloadable interactive statistical programs which generally need to be paid for. Interactive Statistical Programs is a comprehensive system for learning and teaching purposes (Maridakis and Winkler 1984). 'Statistics for the terrified' is an example. These programs have simpler explanations of otherwise complex issues with a lot of examples and pictures and exercises with detailed explanations.

### *2.6 Off shoring and online Tuitions*

Many professional organizations have sprung up in recent times understanding the fact that that students at all levels are terrified with statistics and math. These organizations are normally run by a team of teachers who provide online support to registered students and charge fees in return. The best thing about these arrangements is that they are not limited by boundaries. Teachers may be based in one part of the world and students in another. They may never see each other but are connected through e-mails or common platforms like Groove or Blackboard which allow access

and saving and modifications to files to the authorized participants. Students can ask or send questions to their tutors and tutors can respond to the questions by solving them or suggesting on how the solution can be achieved. This concept is no different than that of off shoring the services, for example, opening call centers abroad. Similarly some countries have historical and natural expertise over others in the field of Statistics. India and China in particular have individuals with comparatively better skills in statistics due high importance given to math in the primary and secondary school stages. India in particular has an English speaking population with statistical expertise and many students in the USA and in UK are opting for online tuitions from India. Also, the online tuition costs are merely a fraction to that of what one would spend on a tutor located in the western world.

### *2.7 Assessment & Evaluation*

Assessment & evaluation are often very time consuming and tedious processes. It takes a big chunk of teachers' time to set assignment or examination questions and then check the examination sheets. As discussed above computer programs and internet has also changed the face of assessment and evaluation as there are many real time tests available online which gives the score of an individual with the click of mouse. Many international online aptitude tests use this method to assess students, examples include GMAT, GRE, SAT etc. These tests are not primarily statistical tests and are administered worldwide for entrance into specific courses. They include multiple choice questions from a host of disciplines like English, Maths (including Statistics), logic & reasoning etc. The computer program ensures that each student taking the test gets a different set of questions of similar level of difficulty. This ensures that test takers' scores are comparable. Similar methods are employed by some universities. But online statistical tests are more common where multiple choice questions are considered to be an appropriate form of assessment.

### **3. Conclusions**

Computers and its associated technology is perhaps the most researched field in this era. High volume of research, interest of corporate houses and potential of huge profits ensures that much more is to come and the present state of advancement is nothing but only a phase of development and will be overtaken by faster, broader and better technology. These changes would definitely affect the discipline of statistics in many ways some of which could be foreseen now and many others can't be. Teachers and students alike need to be adaptive to the changes in the environment by way of continuously updating their skills for good.

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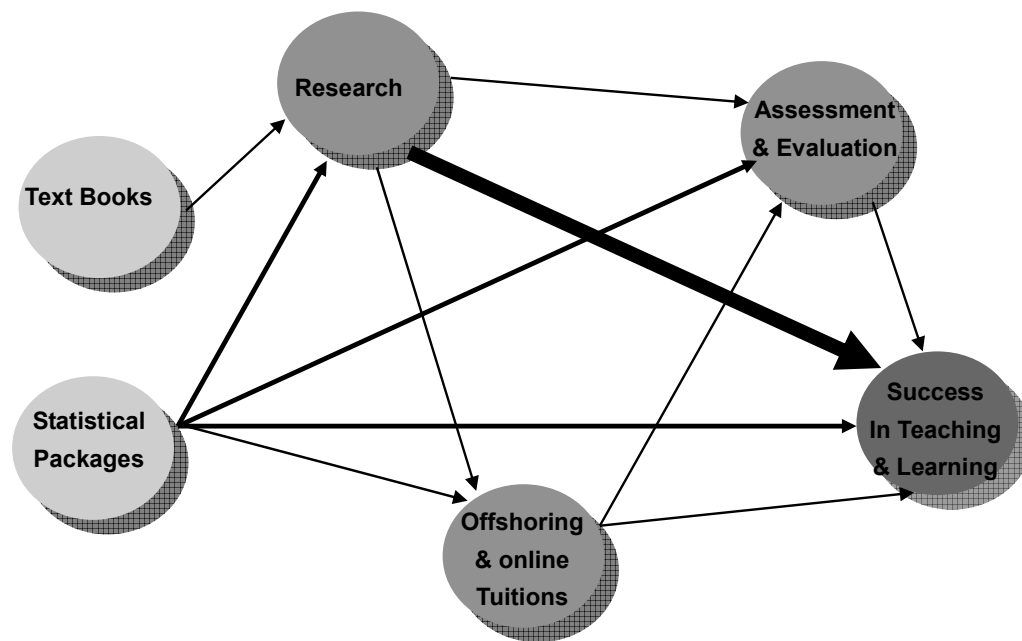


Exhibit 1: An example of Structure Equation Model



# Study on the Process-oriented Integrated Management of Construction Project

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## Abstract

In this article, we put forward the Process-Oriented Integrated Management of Construction Project (POIMCP). According to the process-oriented modeling theory, we establish the definition, character, objective and core task of POIMCP, bring forward corresponding management mode and establish a process-oriented integrated management model by means of the method of IDEF0.

**Keywords:** Construction project, Process-oriented, Concurrent engineering, Integrated management

## 1. Introduction

The construction project process management includes all necessary activities adopted to effectively control final output of project production, and the input of the process is decided by owners' demands to the construction project. Through a series of mutual associated or interactional activities, the final output of construction project process management is the construction project product which can fulfill owners' demands (Jiang, 2006). Because one construction project would experience many indispensable work stages from client contact, project application, feasible research analysis, project evaluation decision, project design, first-stage preparations (such as selections and purchases of main materials and equipments), organization and implementation, plan establishment, controls of project time limit quality and investment to finish, acceptance, delivery and use, so it is very necessary to implement scientific process-oriented integrated management research.

## 2. The concept of POIMCP

Considering the characters such as system, complexity, and dynamics of construction project and combining with actual demands, practices and cases of large of construction projects, aiming at construction project, especially for large-sized construction project, in this article, we put forward the concept of the process-oriented integrated management of construction project and define it as that based on systematical consideration to construction project, the process-oriented integrated management divides the all lifecycle of project into four stages including decision-making, design, construction and operation, and adopts the idea of concurrent engineering aiming at interior and exterior factors, activities and resources in different stages and on difference layers to establish the systematical model combining process system management with technology, and implements system control and harmony optimization of project management to realize the optimization among time limit, quality and cost for construction project (Zhu, 2002).

The process-oriented integrated management possesses following characters.

(1) Complexity. It is mainly to organically organize various parts of the construction project system from bottom to top and from top to bottom and form reasonable hierarchy and function structure to make the system can adopt environment and exert optimal function, establish the uniform model to various stages of all lifecycle such as research, design and production, and various operation stages such as decision-making, plan and marketing, and implement the simulation and actual application of the system, which aim is to realize the harmony among enterprise, economy, resource and environment (Gu, 1998).

(2) The character of process. The process integration first will put forward the problems among technical design, arts and crafts design, frock design and production manufacturing, support neighbor courses each other and carry through the idea of concurrent engineering.

(3) The character of integration. Starting from the whole enterprise, exert the comprehensive integrated method combining with the innovation of management as viewed from the methodology, integrate modern information science, system science, management science, computer science, applied mathematics, corresponding theories and results and expert experiences of professional engineering technology together to instruct the comprehensive integration of the process system.

The essential of process-oriented construction project integrated management is to further eliminate various redundancies and non-increment sub-processes (activities) and all obstacles influencing the process efficiency induced by artificial factors and resources after finishing information integration and harmony among various

courses of construction project to optimize the total process of the construction process, which is represented in that after putting forward the conflicts among schedule, cost and resource of construction project, the upper courses consider the lower courses, and neighbor courses support each other and carry through the concept of concurrent engineering to implement the management of the whole construction project.

The core task of process-oriented construction project integrated management is to optimize the objective structure and implement the comprehensive plan and control for schedule, cost and resource. In the integrated management control system of construction project, first put forward many plans about division and optimization of project process and stage, implement technical and economical analysis and realize the comprehensive optimization of plan (control) system, then implement relative harmony works according to the situation of every stage, and these project construction activities must work under the control of integrated control system. Starting from the system control theory, this article systematically analyzes the project process control, makes the implementation of system objective ensure the implementation of whole system objective, and various objectives of subsystems are integrated into the complete total subjective system to enhance the management efficiency and exert the whole function.

### **3. The introduction of the POIMCP mode**

Because the project management mode of construction project is selected by the owner according to the concrete situation of the project, the advantage analysis to different integrated degrees of different project management modes and the project management mode with high integrated degree are mainly implemented from the view of owner's benefits. However, more proper project management mode can realize the benefits of the whole construction project and make various participators of the project win together. Considering the characters such as complexity, system and all lifecycle of the construction project and combining with the character of the process-oriented integrated management, this article puts forward the process-oriented integrated management mode based on the concept of concurrent engineering.

The concurrent engineering is the systematic method of product and its production support process concurrent design, and it is a sort of systematic work mode to implement concurrent and integrated design for the product (the concept of the product means all research objectives but not only certain special one product of mechanism or other aspects) and its relative process (Ma, 2003). The concurrent engineering possesses the characters of concurrent, constraint, coordination and consistent, and its objective is to enhance quality, reduce cost project development cycle and project accomplishment time. The concurrent engineering emphasizes that various personnel organizationally cooperate with works and comprehensively design products and clients' demands in the process-oriented construction project. The implementation frame of concurrent engineering includes the people-oriented organizational management frame, computer assistant tool frame and method frame and the integration of other series of frame.

The process-oriented integrated management mode is to exert the ideas of system, management integration and process integration, take the various stages of construction project lifecycle as an organic entity, utilize the dynamic control method and the concept of concurrent engineering starting from the view of three objective controls of construction project, make various participation methods of construction project grasp this point when implementing its function of management, analyze, adjust and perfect the initial project of construction project and the influence of every stage to cost, schedule and quality. The standards of analysis, evaluation, decision and implementation to any project is to complete the construction of project with the shortest work term and high quality in the stated investment budget range (Zhao, 2004).

The organization of the process-oriented integrated management mode is to require respectively selecting one or two principals to compose project leading core of construction representations from main participators of contractors in the process of construction process, building the decision team system of construction project process integrated management information system, timely collect and feed back the information of project decision, project design, project construction, project acceptance and project operation through the construction project process integrated management information system, harmonize and control all participators form cooperation and trust in various stages, make the lower processes support the upper processes, definitude the concrete responsibilities and implementation plans of project construction and ensure the realization of project objective. The Figure 1 is the concrete implementation mode of the process-oriented construction project integrated management.

The process-oriented integrated management mode possesses following characters.

- (1) Simple organizational institution, high work efficiency, and the owner can participate in the preparation, design, and construction of the whole construction project and is in the dominant status.
- (2) Adopting the method of concurrent operation, timely getting the information feedback and the support channel between the upper and lower processes and the term of construction is reduced.

- (3) Emphasizing the cooperative operation from design to the construction and the harmony among various concurrent projects or concurrent works.
- (4) Establishing the integrated management information system of construction project, implementing vertical flow and feedback of information current to the plan and control of various concurrent projects in time, and implementing transverse communication of various concurrent projects to realize resource sharing and mutual compensations.
- (5) Establishing new cooperative relationship among owner, project manager, contractor and supplier, enhancing management benefit reducing the cost of construction.

#### **4. Using IDEF0 to establish the POIMCP model**

As a complex system, the opening of construction project fully increases unforeseen factors. To establish an integrated system, we must fully know the information and process in the project, and the range and information requirements covered by the whole process.

IDEF (ICAM Definition Method) is a set of modeling method to describe the operation in the interior of the enterprise, which is developed as a set of system analysis and design method based on the structured analysis method of US air force ICAM C Integrated Computer-aided Manufacturing project, and it is broadly applied in the software development after reconstruction only exerting in the manufacturing. From IDEF0 to IDEF14 (including IDEF1X), there are 16 sets of method, and every set of method is to obtain special type information through the modeling program. The IDEF method is to establish the image expression and analysis system module of various systems, found the optimal edition of system, and help the conversion among different systems.

Therefore, the IDEF0 functional modeling method is used to establish model to the construction process of construction project, implement recursive hierarchy decomposing from various stages of the whole project to the sub-stage and sub-process, establish mutual association and information communication route among processes, which can clearly understand the whole construction implementation process of the whole construction project.

As seen in Figure 2, the process-oriented construction project integrated management model divides the whole project lifecycle into four functional stages, i.e. project decision-making, project design, project construction and project operation, and the output of every functional stage is the control condition or input of next functional module. The inputs of whole project process are existing resources which include the project entity and relative historical material, and the control conditions includes the construction units and relative laws and regulations in the implementation process of various functions, and relative establishments and equipments, human resources and environments are took as the mechanism of the whole model, and the final output results are products or services, i.e. the intention that establishes this project. In the process of project design and construction, the unqualified designs and projects which can not achieve the anticipative demands should be redesigned, reconstructed, and controlled circularly until achieving the scheduled standard to export to next stage.

Where, to the project demand of construction units and relative laws and regulations in the implementation process of various functions as control conditions, the relative establishments and equipments, human resource and environment as mechanism conditions, and stage results occurred in various sub-stages as output conditions, we should implement comprehensive information treatment, timely feedback, effective guidance and advancement through the information integrated system of construction project.

Various participators of process-oriented integrated management should participate in the decision-making of project, offer advices and opinions for the implementation of the project, and ensure the system character of project decision and the feasibility of the project objective. The design and implementation of project are integrated in single dynamical activity, which makes the design or construction mode not only become into a sort of purchase mode, but a sort of control system of project management. The process-oriented integrated management emphasizes the influences of design stage to the project result, and emphasizes owners' status and function in the whole process of project implementation.

The process-oriented integrated management changed in the aspects of organization and harmony (Adnane, 2004). More and more problems about superposition induced in various participators' participations and implementation in the project implementation process can make various participators who were only responsible for one stage or one work in the project lifecycle have opportunities and impetus to participate in other works, which improves various participators' communication and cooperation, and more detailed decision function division, definitude various decision functions such as harmony, design and plan in the dynamic complex project, so the most proper participator can charge the decision, and more and quicker information communication and feedback can be realized among various decision functions, and the detailed degree and reliability of design, plan or implementation follow can be enhanced.

## 5. Conclusions

According to the up-to-the-minute researches of modern project management, in this article, we put forward the idea of process-oriented integrated management of construction project which core method is to divide the management process of construction project into different relatively independent stages, and we also adopt the ideas of concurrent engineering according to the process-oriented modeling theory and establish the definition, character, objective and core task of the process-oriented integrated management of construction project, and bring forward corresponding management mode and adopt the method of IDEF0 to establish a process-oriented integrated management model. In the whole management process of construction project, we should always surround the special construction project control system composed by three systems including schedule, cost and resource, and take the process-oriented integrated management as a function work of project management to implement through the whole process of construction project management.

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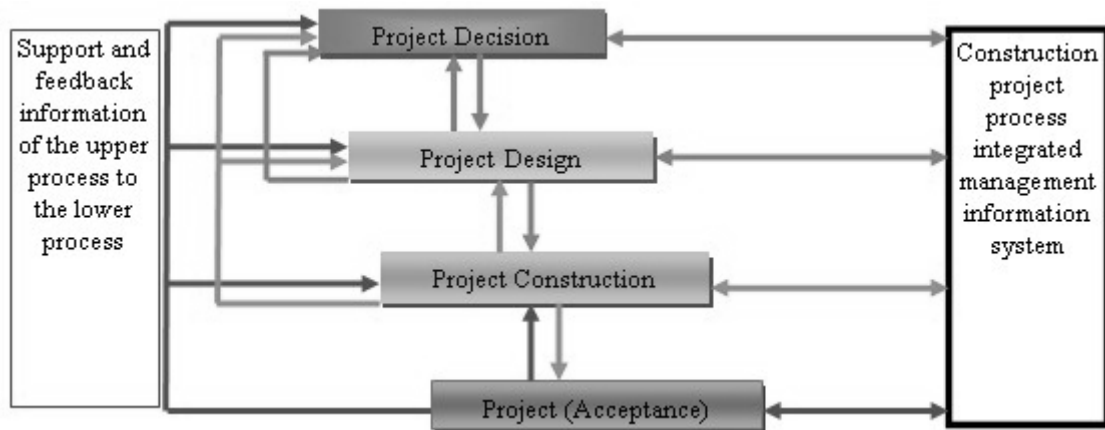


Figure 1. The Process-oriented Construction Project Integrated Management Mode

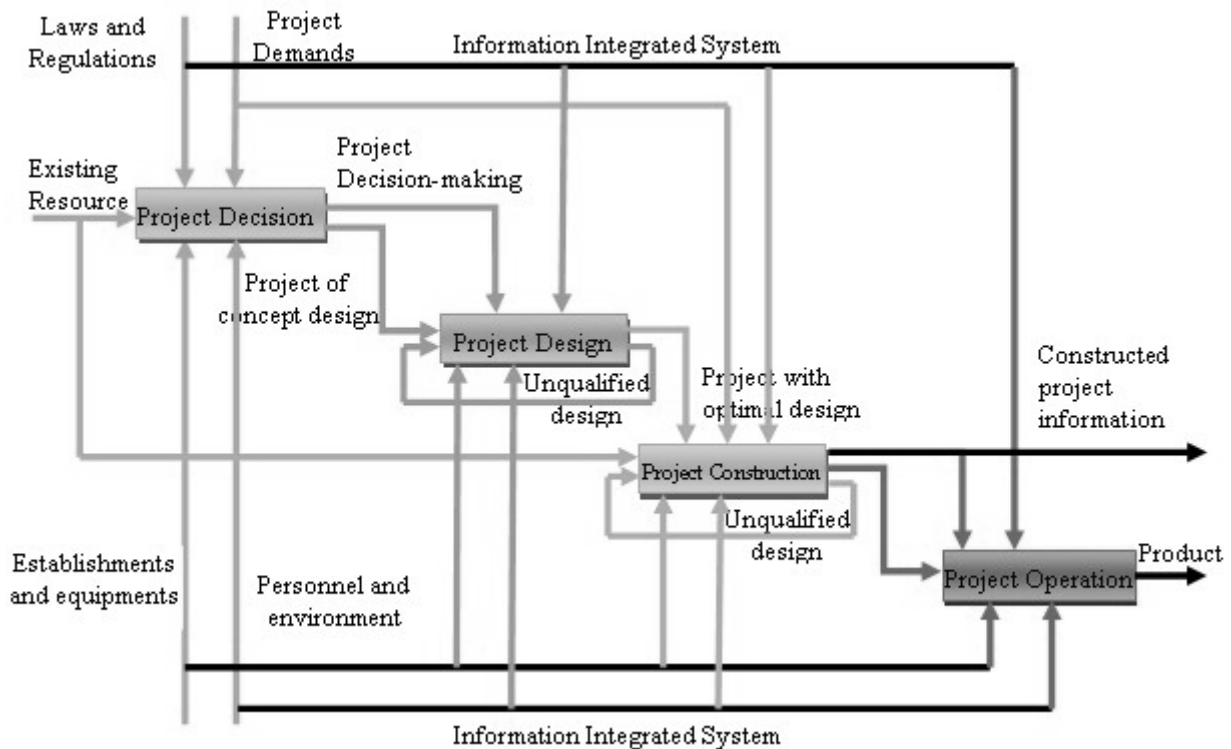


Figure 2. The Process-oriented Construction Project Integrated Management Model

# Ways of Identifying the Opinion Leaders in Virtual Communities

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## Abstract

Virtual communities are the uppermost communication spaces and channels for online word-of-mouth. And opinion leaders are the most important group for enterprises' word-of-mouth communication. As enterprises are engaged in online word-of-mouth marketing activities, the key is to find out the opinion leaders in virtual communities. In this paper, after affirming the effects of opinion leaders and reviewing and summarizing the former ways of finding out opinion leaders, authors will introduce to us how to use the social network analysis method and the UCINET software, together with traditional observations and investigations, to analyze and identify the opinion leaders in virtual communities by case study.

**Keywords:** Virtual community, Opinion leader, Social network analysis, UCINET software

In every social field, from the noble to the humble, once people deviate from being alone, they will be under the control of certain leadership at once. ----- Gustave Le Bon, *The Crowd: A Study of Popular Mind*.

## 1. Introduction

In May, 2007, Samsung performed the word-of-mouth marketing based on online opinion leaders in virtual communities for the mobile telephone U608. Statistical data of results proved that the marketing was successful. From then on, a discussion to the word-of-mouth marketing in virtual communities is uprising. Although the word-of-mouth marketing in virtual communities is still at an exploring stage, enterprises begin to pay more and more attentions on tracing, analyzing, and guiding word-of-mouth marketing by Internet. Combining Samsung's word-of-mouth marketing based on opinion leaders in virtual communities with our study's purpose, this paper tends to answer the two questions as follow:

- (1) What are the main influences (effects) of opinion leaders on individuals' decision in system?
- (2) How to identify the opinion leaders in virtual communities?

## 2. Review of Literature on opinion leaders

### 2.1 Origin of theory of opinion leaders

In 1944, professor Lazarsfeld, in his researches, has found that the public communication does not directly flow to the mass but be interpreted firstly by opinion leaders and then reach the common people. The process is: the mass medium → the opinion leaders → the common people. That is the so-called "two step flow communication". The main contributions of this theory are: (1) Information can be transferred not only by medium but also by interpersonal communication network. In other words, people can obtain information by two channels or any of the two; (2) There is an interface between the medium and the interpersonal communication network, And the interface is the opinion leader; (3) The influences of opinion leaders and interpersonal communication network on information communication and individuals' decision are far larger than that of the mass medium.

### 2.2 The connotation of opinion leaders

Lazarsfeld discussed the concept of opinion leader in his book *The People's Choice* for the first time. After the general election in 1940, he began to notice the effect of interpersonal communication. He found that there was a small part of people who were active in interpersonal communication network, supplying information, opinions, and suggestions for people, exerting personal influences on others, and shouldering an idea-guiding responsibility. Lazarsfeld named them as "opinion leaders". The opinion leader refers to people who provide others with information or suggestions in the interpersonal communication network and at the same time they are activists who can affect others. Kotler (1998) defined "opinion leader" as: people who can influence members in the social community because of special techniques, knowledge, personalities, and other uniqueness.

### 2.3 The characteristics of opinion leaders

Rogers (1962) put forward three typical characteristics of opinion leaders: (1) high social participation; (2) high

social status; (3) high social responsibility. In Roberston's opinion (1971), what makes opinion leaders differ from common group members are: being more directive, more innovative, and more professional. Thereof, professional knowledge is decisive (Solomon, 1992). According to Childers' researches (1986), high knowledge / experiences, high innovation, and high endurance to risks are three main personal characteristics of opinion leaders. Most studies take specialty knowledge and influences as characteristics of opinion leaders. Considering the connotation of opinion leaders, in contrast with their followers, they have these characteristics in general as follow.

(1) They can obtain information by more channels and have rich life experiences. They are knowledgeable and professional in one specialty. They can contact with innovation agencies frequently. (2) They prefer to take part in formal or informal social activities. They have a wide social relationship and connect with the public closely. (3) They have far-reaching insight, innovative spirit; energetic thoughts and they would like to accept new things.

#### *2.4 The effects of opinion leaders*

For individuals, the innovation---decision process has five stages, namely the recognizing and understanding stage, the attitude-forming stage, the valuation and decision stage, the testing and performing stage, and the adoption and execution stage. At the recognizing and understanding stage, people can obtain information by the public medium or interpersonal communication network. But from the attitude-forming stage to the evaluation and decision stage, people are chiefly under the influences of interpersonal relationship. Therefore, the opinion leader plays a key role in the two stages. The effects of opinion leaders in information diffusion are as follow.

(1) The process and interpretation effect. Opinion leaders can provide with constructive information for members in their interpersonal communication network; (2) The diffusion and communication effect. Opinion leaders can serve as communication assistants of innovation agencies, help to understand the need and find out new communication channels; (3) The decision and guidance effect. Opinion leaders are usually the first people who accept innovations. They drive and push the diffusion of innovations; (4) The exterior optimizing effect. According to the externality theory of economics, the behaviors of opinion leaders, such as adopting innovations early, providing with information and suggestions for their followers, helping innovation agencies to communicate new things, show an obvious effect of exterior optimization; (5) The "bridge" effect. Because of the special status and fame, opinion leaders usually possess the central position in their communities. They can connect with many individuals in their communities and can associate with other communities by interpersonal relationship.

### **3. The measurement of opinion leaders**

It is vital for enterprises to identify the opinion leaders exactly and rapidly. Logistically, it is not hard to advance some standards for opinion leaders. However, the problem is that opinion leaders are not fixed people for different products in different system and environment.

#### *3.1 The traditional way of identifying opinion leaders*

Rogers mentioned four ways of identifying opinion leaders in his book *Diffusion of Innovations*: (1) observation; (2) to grade the key roles; (3) social interpersonal relationship measurement; (4) self-identification. These measures are summarized in table 1 as follow.

The observation method is to identify opinion leaders by network structure and behavior traces in the system. For the way of grading key roles, the opinion leaders are appointed in special fields by people who are informed in social system (Butler, 1923). The social interpersonal relationship measurement is to inquire informants whom will they get or ask information or suggestions from in certain special fields (Lazarsfeld, Berelson, and McPhee, 1954). The self-identification is to make informants evaluate their influences and find out the opinion leader (Carlson, 1965).

#### *3.2 The measurement of opinion leaders in virtual communities*

To identify opinion leaders in virtual communities, we can adopt the observation method and the investigation method comprehensively. Procedures are as follow: (1) Find out people who are active and have lots of followers for certain topic in a community forum by observation. If can not, come to the second step; (2) Make an online investigation on followers in the topic and ask them whom they take as their opinion leader. For schools' BBS and other virtual communities that are close to these followers, it will be possible and necessary to make an off-line inquiry; (3) Summarize the data and combine them together with the former observation and identify one or several opinion leaders (notice: considering the diversity of topics in virtual communities, opinion leaders are not necessarily only one).

However, if community members are too much, it is hard to find out the opinion leaders only by observation. Under this circumstance, we can find out the key participators firstly and then identify the opinion leader by the social network analysis method and the UCINET software. This paper takes the fitment part of a virtual community with

more than five thousand members as an example to introduce how to find out the opinion leader. The process is as follow:

(1) Online observation. Target twenty participators who are active and have more followers as objects in further analysis.

(2) Construct a relational matrix. Investigate the details of these twenty activists participating in topics and construct a relational matrix (the social network analysis method is usually to arrange participators in a row-and-column matrix, use 0 or 1 to stand for informants' attitude, and form a relational data matrix. In this study, "1" means consultation and "0" no consultation. In the data matrix, the "1" on row 4 column 3 means the activist "04" consults activist "03" in the virtual community).

(3) The centrality analysis. Procedures are as follow: open UCINET 6.0 → click the data distribution table → copy the data in table 3 and paste them to the data table → store the file "consult about real estate fitment" → enter the operation interface → click the Network in the tool bar → Centrality → Degree → open the file "consult about real estate fitment" → OK. Get the data in table 2 (being processed by standardization).

In order to achieve a more direct expression, we can use the drawing tool in UCINET 6.0 to generate a network relation map. Specific operations are: open UCINET 6.0 → click "Draw" in the tool bar → open the drawing tool "NetDraw" → click and open the file → open the "consult about real estate fitment" → OK. The automatically-generated map is in figure 1.

(4) Analyze and identify. In general, the centrality is the degree of activist's connection with others. It is valued by the number of connections. For a small group (here we do not consider the centrality under the circumstance with many small groups), the more the connections are, the higher the possibility of activist possessing centrality is, and the higher the degree of centrality (Jun Liu, 2004; Jiade Luo, 2005, Kilduff, 2007). By comparing the standardized degrees of participators' centralities and referencing the network relation map, we conclude that the "12" has the highest possibility of being the opinion leader (the standardized centrality degree is 57.895), followed by the "10" (the standardized centrality degree is 52.632).

(5) Correlation analysis and check and identification. If the centrality data and the map analysis fail to recognize the opinion leaders, we can make online investigation that aims at finding out who are the opinion leaders in these participators' opinions. Similar to above, we can get the relational data matrix. In order the check the relationship between opinion leaders and followers, we can adopt the UCINET 6.0 software. Operations are as follow: ① input the matrix from the data window and set up the file "personal-accepted opinion leaders in the topic 'consult about real estate fitment'"; ② open "Tools" → Statistics → Matrix (QAP) → QAP Correlation, choose the file "consult about real estate fitment" and the file "personal-accepted opinion leaders in the topic 'consult about real estate fitment'" → OK. The output data is in table 3. We can find out the Pearson coefficient between the "consult about real estate fitment" and the "personal-accepted opinion leaders in the topic 'consult about real estate fitment'" is 0.805. In general, as the Pearson coefficient is higher than 0.6, the more the informant takes the activist as an opinion leader, the more he or she will follow, vice versa. In other words, we can identify that the "12" and "10" are the opinion leaders for the real estate fitment part.

#### 4. Discussions and Implication

By case study, this paper puts forward the way of identifying opinion leaders in virtual communities. In specific, we can use the social network analysis method and the UCINET 6.0 software, together with the traditional ways, to find out the opinion leaders step by step, aiming at the circumstance of network virtual community. Because of the particularities of virtual communities, such as the anonymous communication among participators, and the weak ties mutually, the way of grading key roles and the self-identification method are not right for identifying opinion leaders in virtual communities. One of prominent advantages of word-of-mouth communication in network virtual community is that both disseminators and acceptors of information will leave traces as they start or follow a topic online, which makes it easy to identify opinion leaders by observation. The implementation of the social network analysis method and the UCINET software can simplify the process to a great degree, identifying the opinion leaders in certain part or whole virtual community exactly. Although we do not check the result further, the measuring items and data are believable because they are simple (one or two problems and data concerns merely 0 and 1) and the network analysis accomplished by the UCINET software in this paper does not concern complex scales. Moreover, this paper focuses on the virtual community that does not demand higher requirements for reliability. It is not necessary to consider the exterior effectiveness. And after many tests, the effectiveness and the reliability can be guaranteed basically. Our contribution in the research is bring forward a new way of identify opinion leader combing with traditional measuring in the virtual community.

Once enterprises identify opinion leaders, they can apply (1) empowerment tactic, (2) experience tactic, and (3)



assembled relation tactic to influence these opinion leaders. Just as what was said by Einstein, the generation of a question is more important than the settlement. Virtual communities are the uppermost spaces and channels for network word-of-mouth communication and opinion leaders are the most important group for enterprises' word-of-mouth communication. Therefore, as enterprises are engaged in network word-of-mouth marketing activities, the vital step is to identify the opinion leaders in virtual communities rightly.

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Table 1. The main ways of identifying opinion leaders.

Category	Description	Measuring Items	Advantage	Disadvantage
(1) observation	Identify by recognizing and recording communication network chain and behavior traces in system.	None	Effective	Right for small system, high requirements for observers
(2) grading key roles	Find out potential key roles by instinct and make further identification by grading.	(1) Who are key roles in the system? (2) Who, in your opinion, is the opinion leader of these key roles?	Save costs and time, direct and convenient	Informant should be familiar with the system structure and individuals to a great degree
(3) social interpersonal relationship measurement	Study whom will individuals ask for information and suggestion as they accept new products / services / ideas.	(1) Who is your leader? (2) Whom will you ask for information or suggestion?	Easy to design; effective, and right for different backgrounds	The investigation should cover amounts of informants. Data is too large to small groups.
(4) self-identification	Every informant values whether he or she is an opinion leader or not by answering a series of questions.	Are you an opinion leader in the system?	Evaluate individuals directly and motivate their later behaviors	Poor exactness and the facts need to be further examined.

Resource: From Rogers. (1994). Translated by Xin, Xin. (2002). Beijing: Central Compilation & Translation Press. No.274. (Being revised)

Table 2. The centrality analysis on participators in topic of consulting about real estate fitment.

	Degree	NrmDegree	Share		Degree	NrmDegree	Share
12 12	11.000	<u>57.895</u>	0.125	10 10	10.000	<u>52.632</u>	0.114
17 17	8.000	42.105	0.091	1 1	7.000	36.842	0.080
14 14	6.000	31.579	0.068	20 20	6.000	31.579	0.068
3 3	5.000	26.316	0.057	8 8	4.000	21.053	0.045
13 13	4.000	21.053	0.045	15 15	4.000	21.053	0.045
5 5	4.000	21.053	0.045	16 16	3.000	15.789	0.034
9 9	3.000	15.789	0.034	19 19	3.000	15.789	0.034
11 11	2.000	10.526	0.023	7 7	2.000	10.526	0.023
4 4	2.000	10.526	0.023	6 6	2.000	10.526	0.023
2 2	1.000	5.263	0.011	18 18	1.000	5.263	0.011
1 Mean	4.400	23.158	0.050	Network Centralization = 38.60%			
2 Std Dev	2.764	14.548	0.031	Heterogeneity = 6.97%. Normalized = 2.08%			
3 Sum	88.000	463.158	1.000	Actor-by-centrality matrix saved as dataset			
4 Variance	7.640	211.634	0.001	FreemanDegree			
5 SSQ	540.000	14958.449	0.070	-----			
6 MCSSQ	152.800	4232.687	0.020	Running time: 00:00:01			
7 Euc Norm	23.238	122.305	0.264	Output generated: 10 四月 08 21:21:10			
8 Minimum	1.000	5.263	0.011	Copyright (c) 1999-2005 Analytic			
9 Maximum	11.000	57.895	0.125	Technologies			

Table 3. The correlation analysis on the topic “consult about real estate fitment” and the personal- accepted opinion leaders for the topic “consult about real estate fitment”.

		Value	Signif	Avg	SD	P(Large)	P(Small)
NPerm							
1	Pearson Correlation:	<u>0.805</u>	0.000	0.000	0.067	0.000	1.000 2500.000
2	Simple Matching:	0.961	0.000	0.801	0.021	0.000	1.000 2500.000
3	Jaccard Coefficient:	0.700	0.000	0.060	0.034	0.000	1.000 2500.000
4	Goodman-Kruskal Gamma:	0.992	0.000	-0.065	0.335	0.000	1.000 2500.000
5	Hamming Distance:	15.000	0.000	75.512	5.238	1.000	0.000 2500.000
consult   opinon leader				QAP MATRIX CORRELATION			
1	Mean	0.121	0.103	Observed matrix: 1.consult about real estate fitment			
2	Std Dev	0.326	0.303	Structure matrix: 2.personal- accepted opinion leaders			
3	Sum	46.000	39.000	for the topic "consult about real			
4	Variance	0.106	0.092	estate fitment".			
5	SSQ	46.000	39.000	# of Permutations: 2500			
6	MCSSQ	40.432	34.997	Random seed: 761			
7	Euc Norm	6.782	6.245	Hubert's gamma: 35.000			
8	Minimum	0.000	0.000	Bivariate Statistics			
9	Maximum	1.000	1.000	Univariate statistics			
10	N of Obs	380.000	380.000	Running time: 00:00:01			
				Output generated: 10 Apr. 08 22:50:50			
				Copyright (c) 1999-2000 Analytic Technologies			

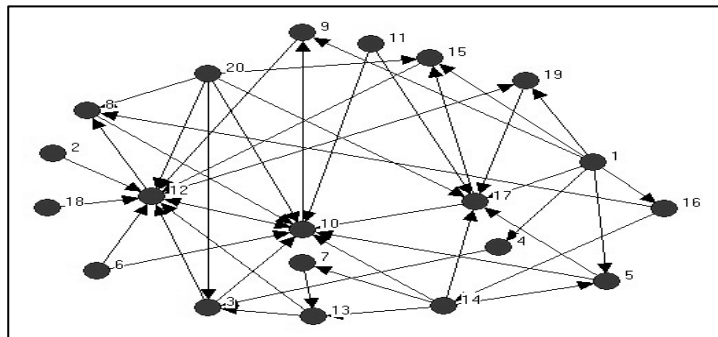


Figure 1. The Network Relation Map of the Topic “Consult about Real Estate Fitment”.

# The Roles of Distributor in the Supply Chain – Push-pull Boundary

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## Abstract

The purpose of this paper is to study the roles of the distributor in the supply chain and to explore its positive contributions. We find that the distributor should act as a push and pull boundary (also called decoupling point) of the supply chain. The definition of decoupling point is needed to be enhanced when the concept of the decoupling point is applied to an industry, like the electronics industry, due to the fact that several decoupling points along a supply chain are possible. The distributor, as a decoupling point, needs to resolve the overstock risk pooled from the upstream parties due to the economies of scale in the production process. On the other hand, the distributor needs to provide fast delivery service with small order quantities and to satisfy the high availability requirement from its downstream parties by providing postponement services to her partners in the supply chain.

**Keywords:** Distributor, Decoupling point, Postponement, Electronics industry

## 1. Introduction

While competition exists not only on the organizations but also on the supply chains, organizations are seldom worked alone and will form a lot of strategic partners or align with their suppliers so as to empower synergy. They will focus on their core competency and outsource the other business process or form partnership with each other. The main idea is to make sure that every party of the supply chain is more efficient and effective than its competitors of other supply chains. The performance of the supply chain is determined by the achievement of the collaboration of every party: “not until the last customer is paying satisfactory, every organization in the supply chain is not earning profit.” With this understanding, every organization in the supply chain has to move out all the obstacles between them and find out a win-win scenario which emphasis a partnership relationship.

However, we found that most of research works concerning SCM put the emphasis on the aspect of responding to customer demands by a responsive strategy in correspondence to the front line demand (also called real demand), for example, Dell’s Virtual Integration Model (Magretta, 1998), Benetton and Zara’s Quick Response Model (Dapiran, 1992; Christopher et al, 2004) and the Vendor Managed Inventory System between P&G and Wal-Mart (Vergin & Barr, 1999; Waller et al, 1999). Actually, the prime goal for these practices is to meet the customers’ value without sacrificing on inventory cost (Ketzenberg et al, 2000), to shorten the lead time (Lampel & Mintzberg, 1996; Pagh & Cooper, 1998), and to alleviate the bullwhip effect (Lee et al, 1997). Consequently, how to improve manufacturer-retailer relationships becomes a hot topic since Kumar (1996).

It seems that the collaboration between manufacturer and retailer is the vital solution to manage demand uncertainty for having a good supply chain performance. However, what is the role of distributor in the supply chain? Is it the element of multiplying the bullwhip effect and hindering the transmission of real demand information? Are there any positive contributions provided by the distributor to the supply chain? Can the collaboration between distributor and manufacturer (or retailer) improve the supply chain performance? We use this paper to study the roles of the distributor in the supply chain and to explore its positive contributions. An example company (a distributor of electronics components) is used to illustrate the values and functions of the distributor to the supply chain and its upstream and downstream supply chain parties.

## 2. Decoupling point (push-pull boundary)

Stock sometimes has to be held owing to the business nature. A typical example in the electronics industry is that silicon and germanium which are used in semiconductor manufacture have to be produced in their most economical batch quantity. It would not be economically feasible to reduce and/or tailor the production batch quantity to fit the downstream demand with small order size. Therefore, the location of stock holding becomes a strategic decision and absolutely critical to the success of this type of supply chain.

In the case of the electronics industry, the distributor (our example company which is located in Hong Kong) naturally becomes the location of stock holding and therefore acts as the push-pull boundary where the process is expected to change from large quantity process to small batch flow. That is, the push-pull boundary separates the part of the supply chain that responds directly to the customer from the part of the supply chain that uses a strategic stock to buffer against the variability in the demand of the supply chain. Downstream from the push-pull boundary all products are pulled by the customer, that is, they are market driven while upstream from the push-pull boundary the supply chain is forecast driven.

On the downside of the push-pull boundary is a highly variable demand with a large variety of products and upstream from the push-pull boundary the demand is smoothed with the variety reduced. This indicates that the point of supply chain differentiation is at the push-pull boundary and the stock held at the push-pull boundary is playing a strategic role to act as a buffer between variable demand and a level production schedule. In other words, the push-pull boundary is the point at which strategic stock is often held as a buffer between fluctuating customer orders (and/or product variety) and smooth production output.

From the above observations, a straightforward concept has been developed for the meaning of push-pull boundary. In fact, we can find a similar concept of 'decoupling point' discussed in Hoekstra and Romme (1992). The concept of decoupling point was summarized by the following three functions.

Function 1: It separates the 'part of the organization oriented towards customer orders from the part of the organization based on planning'.

Function 2: It separates the customer-order part of the activities from the activities that are based on forecasting and planning. The customer order penetrates as far as the decoupling point, and from there the goods ordered are supplied to the customer.

Function 3: It coincides with a main stock point while downstream from it there are no stocks.

For Function 3, it should be understood that the main stock point is the "strategy" inventory point as discussed in Christopher and Towill (2001). Hence, Function 3 is modified to Function 3\* shown below.

Function 3\*: It coincides with a main "strategy" stock point while downstream from it there are no "strategy" stocks.

Therefore, the upstream of the decoupling point is where the push strategy is used and activities are based on a *forecast-driven* planning. It is the "push" area of the push-pull boundary. On the other hand, the downstream of the decoupling point is where the "pull" strategy is used and activities are based on *order-driven*. The decoupling point is the last major strategic stock point. Figure 1 shows the concept of decoupling point.

(See Figure 1. The concept of decoupling point)

In fact, cost and productivity performance are important for upstream operations when price is the dominant order winner, whereas downstream operations need to measure the means of flexibility and delivery lead times for competing on design, flexibility, and delivery speed. According to the study of Order-Penetration-Point (OPP) in Olhager (2003), the trade-off between (i) maximum manufacturing efficiency that dominate the pre-OPP operations and (ii) minimum inventory investment that dominates the post-OPP operations, while at the same time maintaining a high and consistent level of customer service becomes a vital strategy decision. Obviously, OPP is a type of push and pull boundary where is the most favorable strategy position to hold the stock for further differentiation activities due to the risk and uncertainty costs tied to the differentiation of goods. Bucklin (1965) discussed that differentiation could occur in the product itself and /or the geographical dispersion of inventories.

In the electronics industry, the stock of electronic component held in the push-pull boundary is still in its "neutral" form which is critical for form postponement activities for further differentiation. Moreover, the electronic products are also having the benefits of commonality that could supply to different industries further downstream.

Furthermore, Hong Kong, with its geographical advantage to serve the Pearl River Delta area, naturally becomes a stocking place for electronic component.

### 3. The industry and the example company

In order to have a better picture to understand the role of distributor in the supply chain, we choose the electronics industry in Hong Kong since it is facing the problems of volatility demand, short product life cycle and fluctuation of supply price. In fact, the success of Hong Kong's electronics companies lays great emphasis on the quick response on customers' need by monitoring the product trends. Thus, a proper supply chain strategy should be a responsive one which might rise a question of bypassing the distributor to achieve quick response. However, the fact is that Hong Kong (and the Pearl River Delta area) is an important trading hub for electronic parts and components in the Asia-Pacific area. Apart from Chinese products, many items from Japan, Taiwan, the US and South Korea are re-exported via Hong Kong by distributors. From the study of HKTDC (2006), Hong Kong's electronics industry accounted for 48% of Hong Kong's total exports in 2005 and is the largest export category of Hong Kong. This feature of having many distributors in such an industry is a great topic for us to research and generate some knowledge both beneficial for the industry and academic.

Actually, the Pearl River Delta region is crowded with manufacturing plants. They come from different industries such as electronics, toys, watches, etc. Most of them need some electronics components to fabricate their products such as electronic toys, digital watches and consumer electronics. As China becomes the world factory, the Pearl River Delta area is one of the main manufacturing areas of China. This situation forms the centralization of industries in one main area and creates a need for some electronics distributors to re-distribute the electronics components so as to satisfy the different needs arising from different industries. Thus, Hong Kong, because of its location advantage, becomes the electronics distribution center to support the whole Pearl River Delta area as well as the other Asian area.

All the above factors enable Hong Kong to become the place postponement position to serve the downstream player. Moreover, inventories from upstream players are thus 'pooling' in this area for other postponement activities to enhance the supply chain performance.

*The example distributor: a distributor in the Pearl River Delta area*

After knowing the general picture of the Hong Kong's electronics industry, we choose an electronics distributor, Mobicon Group Limited (Mobicon), as an example to illustrate the distributors' roles in the supply chain. The reason why we use Mobicon as our example study is that it is the first listed electronics distributor company in Hong Kong. In order to study the supply chain practices of Mobicon, we will make use of the concept of push-pull boundary to study how a distributor should do in an efficiency way to benefit the supply chain. Figure 2 is an illustration of the relationship between Mobicon and its immediate upstream and downstream partners.

The upstream suppliers of Mobicon comprise of **Manufacturers** and **Principals** (like Motorola and National Semiconductor), and some of the principal's **Agents**. While on the downstream side, its customer consists of **Retailers**, **Traders/Distributors**, and **Manufacturers**. The relationships among them are quite complicated. For instance, it is clear that the upstream suppliers of Mobicon are major IC components manufacturers who gain the benefits mainly from the push strategy. On the other hand, its downstream parties are influenced by the demand pull force because they are further close to the consumers that lead them to face the volatile demand. Consequently, Mobicon becomes the main risk pooling point to support the downstream retailers, distributors and manufacturers. However, this is not the end of the supply chain because the downstream distributors will also supply the manufacturers further downstream.

The role played by Mobicon as a distributor in the supply chain is to solve the conflict of interest between its upstream and downstream players. It is because on the one hand, its suppliers would like to gain the economic of scale from push strategy that requires a large order size and a long lead time (normally longer than 4 weeks) while its customers desire to get some flexibility to face the uncertainty demand so that they favor a comparatively small order size but shorter lead time (normally shorter than 2 weeks).

(See Figure 2. The upstream and downstream partners of Mobicon)

### 4. The decoupling points and the example distributor

The concept of decoupling point is mainly based on an organization that can directly manufacture the products and deliver to the customers. The idea is simple and straightforward within an organization. However, if the concept is applied to an industry like the Hong Kong electronics industry, the decoupling point concept is not that simple to apply. For example, Mobicon could only achieve the first two functions of the concept of the decoupling point defined by Hoekstra and Romme (1992). That is Mobicon could be a decoupling point that (1) separates the 'part of the organization oriented towards customer orders from the part of the organization based on planning', and (2) separates the customer-order part of the activities from the activities that are based on forecasting and planning. The customer order penetrates as far as the decoupling point, and from there the goods ordered are supplied to the

customer. It should be a point that coincides with a main “strategy” stock point but the downstream still has “strategy” stocks! It is because the downstream of Mobicon is composed of different players. Obviously, in the case of retailer, there may be no “strategy” stock. That is, Mobicon cannot achieve Function 3\* as a decoupling point in a supply chain. However, for the downstream distributors and manufacturers, there should be “strategy” stock at a much lower level since it is already ‘buffered’ by Mobicon. It is due to the fact that the distributors of Mobicon would also sell the products to further downstream manufactures. Furthermore, Mobicon would sell the products to manufacturers and these manufacturers would also have their own distributors to deliver their own products. Consequently, it is not easy to apply the concept of decoupling point defined by Hoekstra and Romme (1992) to an industry because there may be more than one decoupling point for “push” upstream activities and “pull” downstream activities along the supply chain. In fact, it can be observed that the supply chain’s risk can be diluted from different decoupling points along the supply chain. On the other hand, this enables the customer order could penetrate into a deeper side of the supply chain from downstream decoupling points to upstream decoupling points.

Hoekstra and Romme (1992) defined five different positions of decoupling point to describe all possible product-market situations in the control concept for an organization (see Appendix for the details). Since we study a distributor in a supply chain for an industry, we modify these five decoupling points for an industry as follows.

Decoupling Point 1 (DP 1) ‘Make and ship to stock’. Products are manufactured and distributed to stock points which are spread out and located close to the retailers.

Decoupling Point 2 (DP 2) ‘Available to stock’ (central stock). End products are held in stock at the end of the production process of the upstream manufacturers and from there are sent directly to many retailers who are scattered geographically.

Decoupling point 3 (DP 3) ‘Assemble to order’ (assembly for some specific manufacturers). Only system elements or subsystems are held in stock in the distributor’s centers, and the final assembly takes place on the basis of a specific manufacturer order as value-added processes to the manufacturers.

Decoupling point 4 (DP 4) ‘Available to order’. Only raw materials and components are kept in stock: each order for a customer, like other distributor, is a specific project.

Decoupling point 5 (DP 5) ‘Purchase and make to order’. No stocks are kept at all: purchasing takes place on the basis of the specific customer order; furthermore, the whole project is carried out for the one specific customer.

Note that DP 1 and DP 5 do not need to be changed since they represent manufacturers and retailers respectively. The above decoupling points are shown in Figure 3 to describe the service functions in different situations.

Obviously, Mobicon provides valued-added services along the supply chain: “Available to stock” at DP 2, “Assemble to stock” at DP 3, and “Available to order” at DP 4 by means of postponement. Because the upstream of Mobicon pushes a lot of risk to it (the decoupling points), Mobicon has to manage well to dilute such risk for the downstream activities so as to minimize the whole chain’s risk. Moreover, the concept of no “strategy” stock after the decoupling point cannot be applied to the downstream of Mobicon since there should be more than one decoupling point downstream. The supply chain practice that Mobicon uses to achieve “no strategy stock downstream” is the concept of postponement. It enables Mobicon to exert its strategy of ‘risk dilute’ and ‘collaborative forecasting and planning’ by which strategic stocks will not be ended up too far from the downstream supply chain and simultaneously the lead time can be shortened.

(See Figure 3: Decoupling Points and functions of distributors in a supply chain.)

## 5. Postponement – how Mobicon serves the electronics supply chain

With the strategic placing of the decoupling point in the supply chain, the strategy of postponement could be used. The aim of postponement is to increase the efficiency of the supply chain by moving product differentiation (at the decoupling point) closer to the end user. It is because the risk and uncertainty costs are tied to the differentiation of goods and differentiation could occur in the product itself and /or the geographical dispersion of inventories (Bucklin, 1965). Postponing the decoupling point reduces the risk of stock-out for long lead time at the distributor and of holding too much stock of products that are not required. One of the leading practitioners of strategic postponement is the clothing retailer and manufacturer, Benetton. Another example is Hewlett Packard which redesigned their printer supply chain to overcome the problem of variability in demand in order to move the product differentiation point to the distribution centers which can be viewed as the decoupling point.

Bucklin (1965) proposed that such product differentiation can be classified into three types: time, place, and form. Based on these three types of postponement, we discuss how Mobicon, as a distributor, serves the electronics supply chain as follows.

*The first one is ‘Time’*, which delays activities until orders are received. Mobicon is at this point where upstream of it prepares a buffer of inventory while capturing the downstream signal of demand from customer orders. This



postponement allows mass customization of customer's order, which facilitates all the flows in the total chain that balance the long lead time and quick response to orders. In fact, it is the function of DP 4 in the previous section. Mobicon acts as the distribution point and keeps components in stock to serve the different downstream players, like manufacturers. This delay of activities could enable the supply chain to capture the real demand easily so as to eliminate the inaccuracy of demand forecast. Activities are order-driven so that obsolescence is minimized.

*The second one is 'Place'*, which delays the movement of goods or services until orders are received. Due to the location properties of the areas around the Pearl River Delta (crowded with manufacturing plants), the role of Mobicon is to ensure the flexibility of the whole chain where inventory is pooling in a single point, like a trading hub. In fact, it is the function of DP 2. Mobicon acts as a central stock point to serve different downstream players, like retailers and OEM. The risk of obsolescence is pooled at this DP 2. That is, Mobicon functions the supply chain by continuously trading off between availability for the delivery requirement and throughput time. Actually, it is a balance of not losing orders from not fulfilling the delivery obligation but has to invest a lot of money in stocks.

In this situation, Zinn (1990) attributes inventory savings through postponement to two factors. The first is the size of the assortment and the variation in demand for finished products, which can be supplied from a limited number of modules. The second is the demand for modules, which is negatively related, allowing for effective risk pooling of generic modules. When modules used in the final manufacturing are interchangeable with a product's inventory, the levels and risk of obsolete inventories are lower (van Hoek, 2001).

*The third one is 'Form'*, which delays activities that determine final form of a product until demand is known. This is a critical strategic function to the supply chain provided by Mobicon. The mass production of semiconductor is manufactured in the natural form while the later part of differentiation like programming is done by Mobicon to ensure the whole benefit of mass production upstream and customization is exploited. It is the function of DP 3 provided Mobicon taking the final assembly on the basis of a specific order. Mobicon has to serve the downstream manufacturers from different industries which may have different requirement on the products needed. So, semi-final form of components is stored in Mobicon and waiting for the final assembly to satisfy the different requirements from manufacturers.

In postponed manufacturing, customization of products can be separated from speculative manufacturing of basic materials. The separation frees primary manufacturing to focus on large economic runs of standard products or generic components and modules. The decoupling point specifies the position in the chain where the customization occurs (van Hoek, 2001).

With the understanding of the postponement practices, the example of Mobicon can be used to generalize the concept of decoupling points for an industry, like the Hong Kong electronics industry in the Pearl River Delta area. In this example, distributor could act as a decoupling point to form a push-pull boundary in the supply chain. The prime objective of this decoupling point is to pool all the risk from upstream to the decoupling point. The risk is then diluted for the next downstream parties of the supply chain. In an industry like the Hong Kong electronics industry, it is common to have several similar decoupling points, like Mobicon. Figure 4 shows the different possible service positions of Mobicon in the supply chain with indication of the use of postponement practices. Figure 4 also presents some possible examples of downstream parties of the supply chain in which we can see how Mobicon serves the whole supply chain in different service positions. For Service Position 1, the immediate downstream supply chain party is retailers. Correspondingly, we have distributors and manufacturers as the downstream parties for Service Position 2 and 3 respectively. In addition, Figure 4 illustrates how the decoupling points are matched with the service positions of Mobicon by means of different forms of postponement.

In short, the strategic position of Mobicon as a distributor in the electronics supply chain is to combine the benefits of push and pull by placing itself on the middle part of the chain. By supporting the push strategy, its upstream partners can minimize cost. In addition, allowing pull strategy in the downstream, its downstream parties could reduce the overstock risk without scarifying the customer service level. However, being a decoupling point of the supply chain, Mobicon is putting itself in a risk pool because the minimum reasonable inventory (MRI) must be set and maintained at a higher level. We use the next section to discuss how Mobicon dilute these risks.

(See Figure 4: Matching the Decoupling Points with the Service Positions of Mobicon in the Supply Chain)

## **6. Risk diluting and demand management in Mobicon**

The challenge for Mobicon is to bring the components (or products) on hand and then forward them to the market as soon as possible. On the other hand, Mobicon needs to influence the market demand by creating more demand on its products.

In order to dilute the risk, Mobicon has developed a strong global network of sales and overseas local services by means of Satellite Development Strategy (SDS), which emphasizes service specialization for different customer segments served by different expertise satellite companies. SDS enables Mobicon much more understand the most updated market trends deeply and broadly. The customer segments in Mobicon are formed by dividing all customers into the category of Telecom, RF Clock & Watch, Lighting & Power Supply, MP3 & Gift Products and Consumer Electronics. In fact, the SDS allows Mobicon to expend its sales channel safely and effectively and therefore it can grow in a rapid manner to increase its distribution channels by partnering with more and more sales agents.

Before being a satellite partner, the sale agent normally is a top agent of a niche market. Hence, by SDS, Mobicon has formed a huge customer database composed of different niche markets. Obviously, potential obsolete stocks can be shifted to different niche markets and therefore the upstream risk pooled at Mobicon can be diluted. That is, the huge customer database also implies that Mobicon have large catalogue of electronics products and therefore it does not need to rely so heavily on specific products. If a particular product is not selling well or there are supply problems, there will be substitute profitable products to smooth overall business performance. Figure 5 shows the flow of upstream electronics components from Mobicon to different niche markets.

In addition, with using the technique of revenue management to manage the demand downstream, Mobicon could also boost profit and ease the tension of the pooled risk upstream. Actually, revenue management has been applied very successfully in the airline, hotel and rental car industries, and now Dell, Nikon, Sharp, etc, are adopting this skill. This is because normally companies use price as a tool to influence customer demand and revenue management techniques are the best solution when products are perishable (e.g. short product life cycle of electronics products), system capacity is fixed (e.g. supply uncertainty in the electronics industry) and market base is segmented (e.g. sensitivity on price or service). Revenue management integrates pricing and inventory strategies to influence market demand. The objective of revenue management can be described as “selling the right inventory unit to the right type of customer, at the right time, and for the right price.” To achieve this objective, Mobicon segments its customers into different industries, different sensitivities on price and service for providing customized prices. Moreover, since in most case the supply of electronics components are not stable, the price of the limited inventory would be set to different levels according to the customers’ urgency.

(See Figure 5. Flow of Material Supply from Mobicon to other industries)

### **7. Small Order Service and collaborative forecast and planning**

In the electronics industry, the normal order size is around US\$400. Purchasers are usually accumulating the orders and wait until the minimum batch size to form a purchasing order (PO). This kind of practice is a well-known factor lengthening the lead time for consolidating the orders. However, time is a critical successful factor in the electronics industry facing the volatile demand. Moreover, this practice is also one of causes of the bullwhip effects. Mobicon’s innovative strategy of Small Order Service (SOS) could alleviate the above difficulties faced by the industry. The practice of it is to lower the order size to US\$60, and most important of all, Mobicon can offer a next day delivery service. This combination of small order quantity requirement and fast delivery facilitates the whole chain and provides a lot of flexibility for its downstream customers. Actually, this is an innovative idea since the distributor would normally expect a larger quantity order size from its customers to minimize the logistic cost. But this approach is quite opposite to the traditional concept by offering a small order service. The main drawback of SOS is the higher logistic cost. To resolve this drawback, Mobicon maintains its own truck capacity level lower than the current usage and outsource the excess to third party logistics (3PL) companies. The outsource contract of the 3PL companies is based on the fixed rate of monthly frequency and weight of the goods. A monthly lump sum is stated on the signed contract with the flexibility of adding extra loadings by extra payment. In this way, Mobicon can make sure its trucks are in full load most of the time to minimize cost while maintaining a service level satisfactory to its customer. The question is why Mobicon would like to provide SOS by paying extra logistic cost. We use the next section to discuss how SOS can be beneficial for the upstream partners by means of collaborative forecast and planning.

### **8. SOS and collaborative forecast and planning**

Success of the electronics industry greatly relies on the abilities to respond to needs and monitor changing trends. The trade off between cost of production, lead-time of supply and volatility of demand within the sector continues to act as a focus for improved responsiveness and developed relationships. Therefore, the positioning of Mobicon at this decoupling point is critical for the success of the total chain. The technique that Mobicon used is the SOS which acts as a tool to achieve collaborative forecast and planning.

According to Seifert (2003), collaboration is an important element for the 21st century corporations to succeed. A well-known global consultant Michael Hammer, who wrote ‘Reengineering the Corporation’ and several follow-up

books, including 'The Agenda', says, "Knock down your outer walls, collaborate whenever you can." He goes on to say that "the walls between the supplier and the customer equal costs and the higher the wall, the higher the costs." Another person, Jack Welch who wrote "Straight from the Gut" emphasis collaboration both internally and externally which gave the success he and GE have enjoyed over the last twenty years.

Competition becomes fiercer and fiercer. The past years we can see the bankruptcy of Kmart, the closing of Service Merchandise, and the announcement of Toy 'R' Us closing Kids 'R' Us stores. However, if Cisco had stayed closer to its customers so as to understand the demand for its products was declining in early 2001, Cisco would have slowed down production and not built inventory for anticipated sales, which ultimately resulted in an inventory write-down of US\$2.5 billion, see Seifert (2003).

In fact, the foremost goal of a company is to ensure the long-term maximization of profit or market value. And collaboration can generate competitive advantages that will lead to the achievement of this goal. Firstly, by looking at the overall cost leadership aspect of competitive advantages, it can help a company to generate higher margins from the same market prices or allows it to set lower selling prices with the same margin. Both can lead to a competitive advantage over rival companies. Collaboration in this field can enable the reducing of production cost, inventory cost, transport cost and promotion cost. Moreover, collaboration can achieve differentiation by increasing product availability through reduced out-of-stocks, improving product quality through identifying weak points in the supply chain and increasing product variety by identifying new gaps in the market. Furthermore, collaboration can achieve focus strategy by paving the way to more precise forecast for certain target groups and markets. This in turn permits competing on broader front and penetrating new niches with an expanded product range. Also, this can generate new customers who had not bought any of the existing products on the market. Alternatively, customers may be won over from a competitor because their needs are better satisfied.

Then, let us look at the SOS and see how it can achieve collaborative forecast and planning. Some customers, especially from manufacturers, normally require small amount of components to design their prototype in the R&D stage. Without SOS, they need to order minimal quantity set by their distributors. It implies that the manufacturer needs to invest unnecessary amount of components for R&D activities. However, because of SOS, customers do not need to invest so much on the designing stage of the new products. They can purchase a number of products or components in small order in the initial design and planning phase. Moreover, the SOS is accompanied by the every day delivery to shorten the lead time. In this stage, Mobicon even develop products with their customers since the product is in the designing time. They pay attention to product design because they understand that nearly 90% of product costs, including shipping and packaging, are set during a product's early design phase. And one of the biggest drivers of high costs is complexity that is introduces during the product design stage. For instance, the batteries of Motorola had been specifying for its cellular phones. As the engineers introduced new products, they kept introducing new and improved batteries, which may have had some increment value from a technical standpoint but added unnecessary complexity to the product line. Had the designers been measured on the concept known as "creative simplicity", they might have worked hard to reuse battery types from one new product introduction to the next.

This collaborative planning in the early stage can also achieve a collaborative forecast as Mobicon knows early about the demand from its downstream customers (manufacturers) and can pass this information to its upstream suppliers. In most case, upstream parties are passive towards customer demand. They are lead by the market demand and struggle to follow it in their operation for survive. However, SCM professionals are people who take the challenge to manage the demand and try to play an active role to influence demand. Thus, the implementation of small order service can let the customers reduce the cost in the planning stage by collaboration, and with the close collaboration, they can generate the forecast at a very early stage of product development. With this forecast, Mobicon can have enough time to make sure the actual demand and pass this information to the upstream supplier to prepare for the coming demand.

This innovative SOS strategy makes the collaborative planning and forecast to be achievable that results in total cost leadership, differentiation and focus. A principle in business is that you cut costs to survive, but you innovate to prosper. Use supply chain management to drive innovation and create value so as to get strategic advantage.

## **9. Discussion**

In summary, the performance of the companies at the decoupling points (or the location of the push-pull boundary) is one of the critical factors for the success of a supply chain. It is important that the supply chain's risk can be pooled in these decoupling points. We use Mobicon, the example distributor, to discuss how the risks pooled and how a distributor handles such risks. To handle the conflict of economies of scale and quick response to market demand, postponement is employed. Depending upon the positions of decoupling points, the distributor can use

different form of postponement to dilute the risks. Moreover, we also found that Mobicon aligns partners from the upstream and downstream in a collaborative way to improve the performance of the supply chain. By using the SOS strategy, the collaborative planning and forecast can be achieved, which enable the chain to achieve total cost leadership, differentiation and focus. We also found that the technology involved is not a great impact. The most crucial point is the operation strategy of SOS to link up those players that added a remarkable value for the whole chain.

From this study and the example distributor, we also note that the distributor is not only a part of the marketing channel. In general, she also plays a critical role by standing on the point where those forecast-driven activities and order-driven activities meet. It is here the distributor employs SCM techniques, such as postponement, to turn the "PUSH" into "PULL" successfully. Moreover, it is here the distributor uses collaborative tools to transfer more demand data to its upstream players by using some appropriate strategy, like SOS in our example, to achieve collaborative forecast and planning. Although it cannot act as the information decoupling point (Mason-Jones and Towill, 1999) - the point in the information pipeline to which the marketplace order data penetrates without modification, and is here where market driven and forecast driven information flows meet; the distributor still could provide more accurate demand data for the reference of the upstream players.

Other areas of the role of distributors have not discussed. When directly dealing with the retailers, the manufacturer could better understand the real demand and therefore lower the inventory level. However, the manufacturer does not have good customer base in term of wide variety, which is quite important for business as it will facilitate the economic of scale of sales and after sales service because the channel of distributors can be enlarged in a faster way. Moreover, in the aspect of development of customer base, manufacturers could fully utilize the relationships between distributors and their customers to enhance collaboration. Although manufacturers could rely on their brand name to attract customers, it could only retain those high loyalty customers. The case of Disneyland in Hong Kong is a good example to illustrate this. Even though Disneyland is a very famous brand name, it cannot get the market share from the local theme park, Ocean Park, because Ocean Park keeps a very close collaboration with its distributors (travel agents). In this case, Ocean park gets the benefits from its distributors' relationship with its customers and the widely spread of distributors could enable Ocean Park to cover a larger range of customers. The situation is even favorable to Ocean Park when it works with its distributors in high travel seasons that absorb most of the visitors traveling in Hong Kong.

## 10. Conclusion and further research

This paper discusses the positive contributions of distributors to a supply chain in an industry. Distributors can improve the effectiveness and efficiency of the supply chain by moving the decoupling point further from the manufacturer and more close to the downstream players.

We believe that we should not simply take the distributor away from the supply chain studies in order to facilitate quick response and alleviate the bullwhip effect. We need to further and fully exploit the benefits from economics of scale and flexibility to the supply chain provided by the distributor. To achieve this, we need to study more how the distributor strategically acts as an efficient decoupling point (push-pull boundary).

Empirically, we can use the 3 forms of postponement as the operational performance measurement of a distributor in a supply chain. The development of the corresponding measuring instrument can be one of our further research topics. On the other hand, since this paper is based on one distributor of the electronics supply chain, the results of this paper cannot be generalized for all distributors and/or all industries. Further research should include more than one distributor and/or from different industries.

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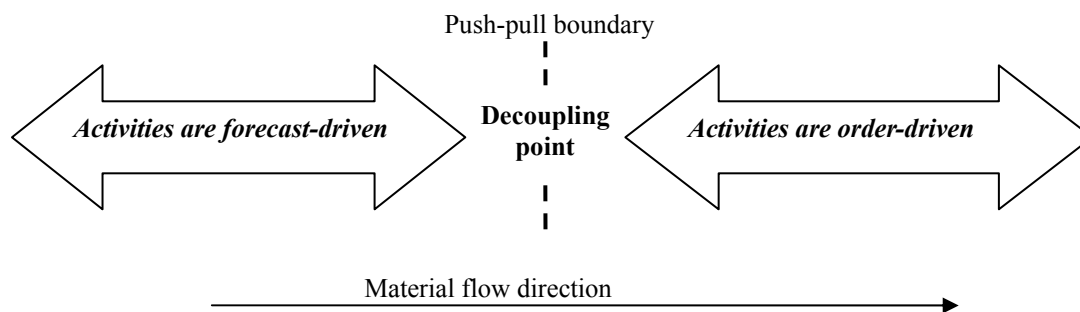


Figure 1. The concept of decoupling point

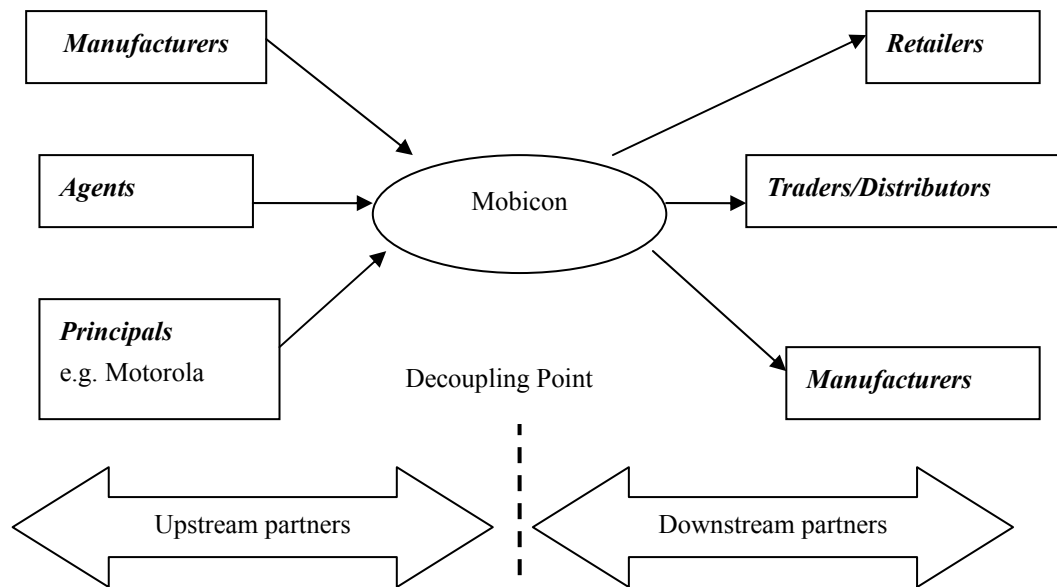


Figure 2. The upstream and downstream partners of Mobicon

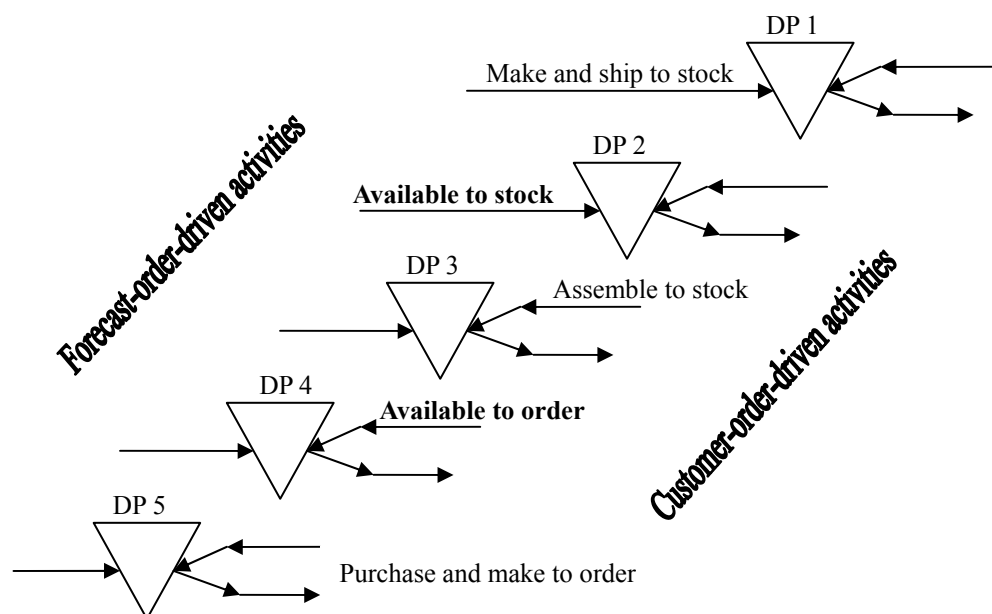


Figure 3. Decoupling Points and functions of distributors in a supply chain.

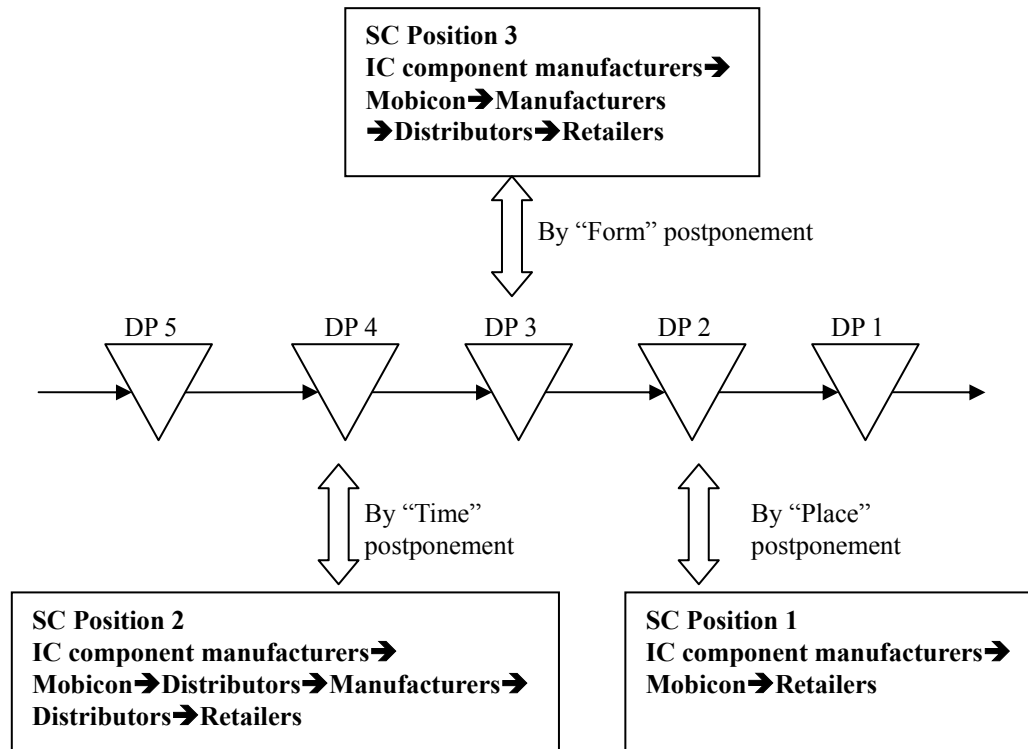


Figure 4. Matching the Decoupling Points with the Service Positions of Mobicon in the Supply Chain

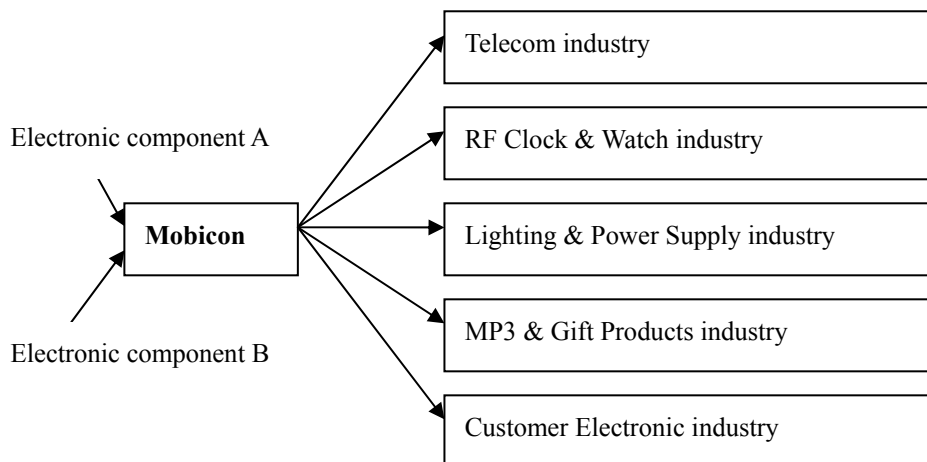


Figure 5. Flow of Material Supply from Mobicon to other industries

## Appendix

Five decoupling points described in Hoekstra and Romme (1992, page 1-8):

Decoupling point 1 (DP 1) 'Make and ship to stock'. Products are manufactured and distributed to stock points which are spread out and located close to the customer.

Decoupling Point 2 (DP 2) 'Make to stock' (central stock). End products are held in stock at the end of the production process and from there are sent directly to many customers who are scattered geographically.

Decoupling point 3 (DP 3) 'Assemble to order' (assembly for one specific customer). Only system elements or subsystems are held in stock in the manufacturing centre, and the final assembly takes place on the basis of a specific customer order.

Decoupling point 4 (DP 4) 'Make to order'. Only raw materials and components are kept in stock: each order for a customer is a specific project.

Decoupling point 5 (DP 5) 'Purchase and make to order'. No stocks are kept at all: purchasing takes place on the basis of the specific customer order; furthermore, the whole project is carried out for the one specific customer.

Those decoupling points are indicated in Figure 7 below to describe all possible product-market situations in the control concept.

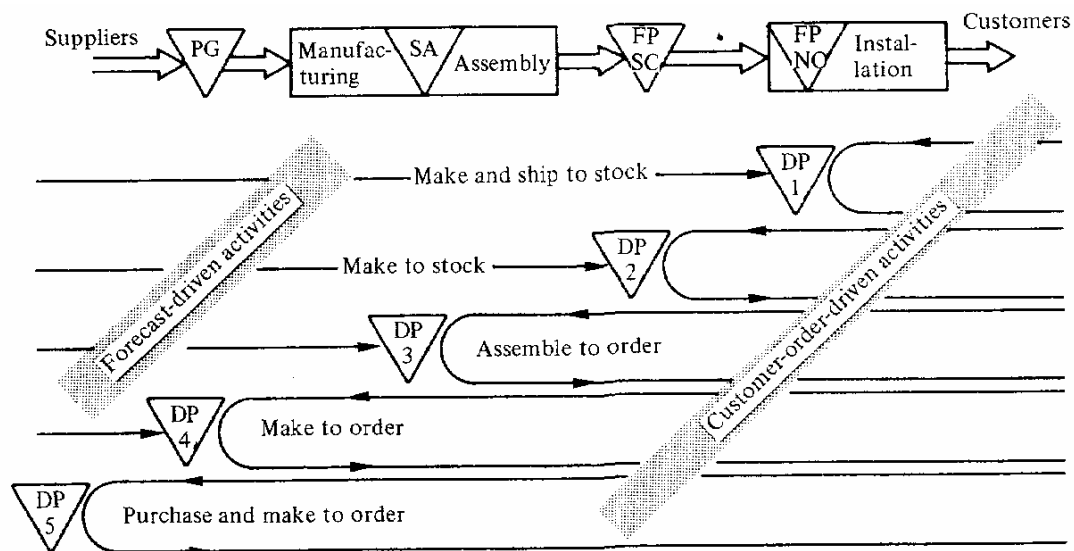


Figure 7. How far does a customer order penetrate? (Source: Hoekstra and Romme, 1992, page 7)



# The Consequences of Supervisory Power – The Contingent Effect of Age and Length of Service

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## Abstract

The superiors' power bases on work autonomy and satisfaction with supervision in Malaysian manufacturing companies was investigated. The influence of superiors and subordinates age and length of service were also explored. 210 data was collected from technical staff of manufacturing companies indicated that supervision of industrial people were most acceptable through the exercise of referent power, expert power and reward power. Among the power bases, reward power was most often exercised when the work autonomy is high. The work autonomy was found to be positively associated with the satisfaction with supervision. The perception of expertise was found to be associated more with superior and subordinate age differential rather than their length of service.

**Keywords:** Management, Organizational Behavior, Power Bases, Work Autonomy, Satisfaction, Managerial Supervision, Age, Length of Service

## 1. Introduction

This research seeks to find out the power impact on subordinates' work autonomy and satisfaction with supervision. There are two main sources of power in the organization (Bass, 1990). The first is related to one's position (positional power) to influence others who are lower in status. The other source is associated with the extent to which the wielder of power can grant affection, consideration, sympathy, recognition and secure relationships to others (personal power) which are normally acquired through personal attributes such as expertise, abilities, charisma or contacts he/she may have.

The importance of work autonomy as a variable for organizational study, on the other hand, has been well established as antecedents or outcomes of power. Spector's (1986) meta-analysis over 40 studies showed autonomy to be strongly associated with employee turnover, absenteeism, performance, motivation, physical ailments, emotional distress, and job dissatisfaction.

Furthermore, previous empirical research has devoted considerable attention on job design or job characteristics. Very little research has been in finding a linkage of power applications and work autonomy. Knowing how power affects work autonomy and satisfaction will allow superiors to change or maintain their power bases to achieve desirable outcomes.

### 1.1 Objectives of the Study

The foundation of this study is based on the interaction among key variables as depicted in Figure 1 (Note 1). This study also analyzed the impact of age and length of service on power bases, work autonomy and satisfaction.

The applicability of this research is limited to only superior-subordinate dyadic relationships in Malaysian manufacturing companies. This industry is selected for the reason that it represents the fastest growing industry. It also typifies an industry of high economic activities where productivity, job innovation and effectiveness are of central concern. Knowledge gained in this area may be useful toward a more effectual industrial management.

## 2. Literature Review

### 2.1 The Bases of Power

Several classifications have been used in differentiating bases of social power in organizations (Peabody, 1961; Etzioni, 1964; Patchen, 1974; Twomey, 1978; Kipnis, Schmidt & Wilkinson, 1980; Shukla, 1982; Rahim, 1989).

Bases of power typology suggested by French and Raven (1959) are among the most popularly applied in research (Cobb, 1980; Frost & Stahelski, 1988; Rahim, 1989; Rahim, Antonioni, Krumov, & Illieva, 2000). French and Raven defined bases of power as below:

#### 2.1.1 Coercive Power

Coercive power involves the concept of influence based upon “the expectation of punishment for failure to conform to an influence attempt”. The strength of coercive power depends on the magnitude of the “negative valence of the threatened punishment multiplied by the perceived probability that a power recipient can avoid the punishment by conformity”.

#### 2.1.2 Expert Power

This power usually manifests in information, knowledge and wisdom, in good decision, in sound judgment and in accurate perception of reality. Expert power is restricted to particular areas as the “expert” tends to be specialised.

#### 2.1.3 Reward Power

Reward power is derived from the ability to facilitate the attainment of desired outcomes by others. It is a form of social power is closely related to coercive power. If one conforms to gain acceptance, reward power is a work. However, if conformity takes place to forestall rejection, coercive power has to be exercised.

#### 2.1.4 Referent Power

This involves the concept of “identification”, which French and Raven (1959) define as “a feeling of oneness or a desire for such an identity”. If referring to a group, then an individual seeks membership in such group or has a desire to remain in an association already established. This base of power usually has a tremendous impact on interpersonal relationships.

#### 2.1.5 Legitimate Power

Legitimate power is induced by norms or values of a group that individuals accept by virtue of their socialisation in the group. Legitimacy is dependent upon relationships between social positions, not on the personal qualities of role incumbents.

### 2.2 Work Autonomy

The type of power used to exercise control will impact upon the type of involvement on the part of the controlled subordinates. One variable that is likely to be affected by the variation in the exercise of self-control of the subordinates is work autonomy. Breugh (1985) defined three autonomy facets as follows:

#### 2.2.1 Work Method Autonomy

The degree of discretion/choice individuals have regarding the procedures/methods they utilise in going about their work.

#### 2.2.2 Work Scheduling Autonomy

The extent to which workers feel they can control the scheduling/sequencing/timing of their work activities.

#### 2.2.3 Work Criteria Autonomy

The degree to which workers have the ability to modify or choose the criteria used for evaluating their performance.

It should be emphasized that the essence of these definitions lies on employee’s perceptions as regardless of the amount of autonomy subordinate really has in their work, it is how much they perceive that they have which affects their reactions to the job. Langer (1983) has recently provided substantial evidence that autonomy is a basic human need which if unfulfilled can affect an individual’s physical and psychological well being. Autonomy has received considerable attention in the context of job characteristics (Hackman & Oldham, 1976; Sims, Szilagyi, & Keller, 1976). Loher, Noe, Moeller, and Fitzgerald (1985) have meta-analyse the relationship between job characteristics and job satisfaction, and found autonomy to be highly related to job satisfaction than any of the other job characteristics. Based on the above mentioned findings, it is anticipated that in the present study, job autonomy as one consequence of the various types of power applications should co-vary with satisfaction with supervision.

### 2.3 Satisfaction with Supervision

Job satisfaction is a collection of feelings or affective responses of the organizational members which are associated with the job situation within the organization. Smith, Kendal and Hulin (1969), in their well documented measure, the Cornell JDI (Cornell Job Descriptive Index) described five areas of satisfaction: the work itself, the supervision, the co-workers, the pay, and the opportunities for promotion on the job. Since the present study is on the superior-subordinate relationships, the job-facet satisfaction is most relevant to satisfaction with supervision.

Clearly, from human relations perspectives, supervisory satisfaction is related to the personality traits of the superior which as his/her temperament, openness, industriousness, pleasantness etc. The positive side of all of these traits can enhance satisfaction. Related to the personal resourcefulness, supervisory satisfaction is also dependent on the superior's distinguishing qualities and abilities such as intelligence and knowledge.

#### *2.4 Age and Length of service*

Age and length of service were evaluated to enhance understanding of the manner in which the physiological and psychological changing of aging influence human behaviour and perception. A stream of research in organizational behaviour literature (Gibson & Klien, 1970; Hunt & Saul, 1975; Schwab & Heneman, 1977; Churchill, Fords, & Walker, 1976; Busch, 1980) provided the basis for developing and testing hypotheses on the effects of aging and length of service as they relate to the bases of social power and work autonomy.

### **3. Hypotheses to be tested**

The following hypotheses were formulated for the study.

H1a: Superiors' non-coercive bases of social power (expert, referent, reward and legitimate) are positively associated with the subordinates' satisfaction with supervision.

H1b: Superiors' coercive base of social power is negatively associated with the subordinates' satisfaction with supervision.

H2: Subordinates' work autonomy is significantly and positively related to the development of reward and referent bases of social power in the relationship with superiors.

H3: Work autonomy is significantly and positively related to the satisfaction with supervision.

H4a: The superiors' expert, reward and referent power bases are negatively related to the subordinates' age.

H4b: The superiors' expert, reward and referent power bases are negatively related to the subordinates' length of service.

### **4. Research Methodology**

#### *4.1 Sampling Design*

The sample was chosen from the members list of the Federation of Malaysian Manufacturers. Data from subjects were secured through survey questionnaires. A cover letter explaining the purpose of the study and a self-addressed and stamped envelope accompanied each questionnaire. It was also requested in the cover letter that the questionnaires were to be distributed to the technical staff of the company.

#### *4.2 Research Instruments*

All data used in the study consist of responses to questionnaire items. Measures of relevant constructs were discussed here.

##### *4.2.1 Bases of Supervisory Power*

The five French-Raven bases of supervisory power were measured by using the Rahim Leader Power Inventory (RLPI) (Rahim, 1988). This multi-item instrument uses a 5-point Likert scale to measure perceptions of subordinates regarding their superiors' bases of power. The instrument comprises of 29 items. The order of items was randomized in the questionnaire to avoid response bias. Also some items were phrased positively and others negatively to overcome the problems of acquiescence, i.e., "yea" or "nay" saying tendencies. The scores for negatively phrased items were reversed before analysis. The indices of the five power bases were constructed by averaging the subject's responses to the selected items belonging to each power base. This resulted in the creation of five continuous subscales. There was substantial evidence of the criterion-related validity of the inventory when tested against the measure of compliance with superior directives and wishes (Rahim, 1988). The test-retest and internal consistency reliabilities of the subscales ranged from .77 to .91 and .70 to .86 respectively.

##### *4.2.2 Work Autonomy*

Work autonomy was conducted using the instrument designed by Breugh (1985, 1989) and Breugh and Becker (1987). The instrument which is capable of measuring three facets: method, scheduling, and criteria of work autonomy, comprises of 9 items. The items were responded to on a 5-point Likert scale continuum in which a higher value indicates greater work autonomy. In an effort to avoid responses bias and the problem of acquiescence, the order of items was randomised and some items were phrased positively while others negatively when constructing the questionnaire. The scores for the negatively phrased items were reversed before analysis. The scale had undergone extensive construct validation processes (Breugh & Becker, 1987; Breugh, 1989). The

internal consistency reliability coefficient (alphas) was reasonably high (greater than 0.78 for all studies). Good factorial clarity had been observed in all component items of the scale. The confirmatory factor analysis confirmed that the autonomy scale fits the sample data. The validity of the scale had also been tested by examining its relationship with other theoretically related work variables, i.e. participation in decision making, supervisory satisfaction, general job satisfaction and role ambiguity. Although the three autonomy facet scales were seen as providing more useful information (Breugh, 1985, 1989), in our case, where the interest is in the general relationship among variables and not in the precise organizational diagnosis, a global measure of autonomy is all that is needed. The global index of work autonomy is thus evaluated from the mean of unweighted sum of 9-item scale measure.

#### 4.2.3 Satisfaction with Supervision

The instrument used to measure satisfaction with supervision is the updated version of the original Job Descriptive Index (JDI; Smith et al., 1969) which was later revised by Roznowski (1989). The instrument is made up of 18 items. The 3 point responses were dichotomised so that a negative response ("yes" to a negative item or "no" to a positive item) was scored 0. A positive response was scored 1. "I don't know" response ("??") was scored 0 because past research have discovered that these responses were more typically from dissatisfied employees rather than satisfied employees (Park, 1983; Segall, 1983; Smith et al., 1969). The revised scale was shown (Roznowski, 1989) to be more internally consistent than the original scale with the alpha coefficient of .912. The unweighted sum of the individual item score was used as a measure of satisfaction with supervision.

#### 4.3 Data Analysis Techniques

Reliability and factor analysis was used to check the consistency and dimensionality of the scale items. Multiple regression analysis is performed to check the criterion-related validity of the scale items. Pearson Intercorrelation was used to measure the associations among the social power bases, work autonomy and satisfaction with supervision. Partial correlation was performed to assess the relationship between age and job tenure with the social power bases.

### 5. Research Results and Discussions

#### 5.1 Sample Characteristics

Data from 230 respondents were received and only 210 data were usable. By ethnic group, 72% of the respondents were Chinese, 18% were Malay, and 8% were Indian, while other races made up the rest.

Attempts to obtain more female respondent to test male-female differences were not successful due to the much smaller proportion of female taking supervisory roles in the factories. A mere 7% female respondent reflects the male domination in the industrial sector.

More than 60% of the respondents were from factories located in the state of Selangor where factories were largely concentrated in the Klang Valley. Other states like Perak, Penang, Kedah and Perlis account for only 20% of the total respondents. The remaining respondents were from factories scattered in the states of Johore, Negeri Sembilan, Malacca and Pahang.

In terms of age, the highest proportion of respondents fell into the 31-40 years age group. They accounted for 50% of the total number of respondents. This was followed by the 20-30 years age group (34%), while those above 41 years old accounted for the remaining.

Overall, the education level of the respondents was high. Nearly 61% of the respondents had education up to university in technical field while 15% received university education in non-technical field. Only 24% of the respondents had no tertiary education. The high educational level was reflected in the position or the type of occupation held by the majority of the respondents i.e. 5 Assistant General Managers, 54 Divisional Manager and Assistants, 74 Engineers and Assistants, 11 Chemists, 32 Supervisors, 12 Plant Operators and the rest comprised of System Analysts, Draughtsmen, Quality Control Inspectors etc.

The average salary of the respondents was higher than the population's average. The survey data showed that 29% of the respondents earned more than RM5000 per month, 12% earned RM4001 to RM5000 per month, 16% earned RM3001 to RM4000 per month, and 13% earned RM2001 to RM3000 per month.

On average, the respondents had worked in the present company for 7 years. It was noted that 22% of the total respondents had worked for one year or less in the present company, 23% had worked between 2 to 4 years, 21% had worked between 5 to 8 years, and 17% had worked between 8 and 12 years, while only 12% of the respondents had worked longer than 12 years in the present company.

In terms of the organizational size, the survey had selected sample which represents the medium to large sized Malaysian manufacturing companies. The average number of employees of the factory sample as 275. It was

found that 41% of the factories had 25 to 100 employees, 24% had 101 to 200 employees, 14% had 201 to 400 employees, 10% had 401 to 1000 employees and 11% had more than 1000 employees.

Classifying the factories according to the type of business revealed that a greater portion of the factories manufactured machinery (29%), followed by food (13%), chemical (13%) and the rest manufactured non-metal, basic metal, textile, wood and paper.

The survey also revealed the information about the respondent's superiors. Almost all of the superiors reported in the survey were males with the exception of one female. A majority of them were holding medium to high management positions. Racial composition of the superiors was: 76% Chinese, 7% Malay, 7% Indian and 10% from other races. On average, the superiors had worked in the organization for 11 years – far longer than the subordinates' average. Only 9% had worked for less than a year, 16% had worked between 1 and 5 years, 34% had worked between 6 and 10 years, 15% had worked between 11 to 15 years, 15% had worked between 16 to 20 years and the remaining 11% had worked more than 20 years in the present company. Most of the superiors were holding high positions in the company with 36% of them in the first hierarchical level, 31% in the second level, and 24% in the third level, while only a fraction of them were in the lower management positions. Their educational level was also strikingly high, with 70% of them having had tertiary education in technical field and 12% having had tertiary education in non-technical field. Only 18% had up to either primary or secondary education. By designation, 40 of the superiors were the Directors of companies, 32 were the General Manager, 89 were the Divisional Managers and the rest consisted of Assistant Manager, Engineers, Supervisors etc.

### 5.2 Validating the Scales

The data on the 29 power items was factor-analyzed. The selection of a factor and an item was guided by the criteria: Eigenvalue > 1.0 and Scree Plot and factor loading > 0.4, respectively (Ford, MacCallum & Tait, 1986). The results are presented in Table 1 (Note 2).

The mean, standard deviation and standardized Cronbach Alpha and the corrected item-total correlation for each subscale is provided in Table 2. (Note 3) The internal consistency reliability coefficients for all the scales were satisfactory (Nunnally, 1978). All the scales had coefficient Cronbach Alpha greater than .70. A corrected item-total correlation is a correlation between an item's score and subscale score computed from the remaining items in the set. The item-total correlations for the five scales ranged between .29 and .76.

A multiple regression analysis was run to test the relationship between the five bases of leader power and the subordinates' satisfaction with supervision. The results are presented in Table 3 (Note 4). The results showed that the referent, expert, and reward power bases positively influenced satisfaction with supervision.

### 5.3 Testing of Hypotheses

H1a & H1b: Power Bases and Supervisory Satisfaction. The correlational results in Table 4 (Note 5) provided good support for H1a. The non-coercive bases of social power (expert, referent, reward and legitimate) showed positive relationships with satisfaction with supervision. Referent power ranked highest among other power exercises (coefficient .64). This was followed by expert power and reward power which both had coefficients of correlation of 0.47. The ranking of intercorrelation was somewhat similar to the study of Rahim and Buntzman (1989) conducted on respondents with post graduate working experiences. It was expected that referent and expert power represent a high level of internalisation or inner acceptance. In the exercise of referent power, internalisation derived from the identification of power recipient with the wielder of referent power – a personalised commitment to the group or its representative. As Raven (1974) found out, the exercise of referent power tends to encourage a more satisfied, cooperative and prolonged relationships between superiors and subordinates.

Expert power benefits from an umbrella of authority which may go beyond superiors' specialised skills. Among technical staff, expertise emerges as a very important cue for acceptance and recognition of the superiors' direction as reflected in the present result. It most likely gains their compliance and least likely to provoke their resistance (Podsakoff & Schriesheim, 1985). Similarly, greater satisfaction with supervision among subordinates may lead to greater cooperation and heightened dependence.

Both referent and expert power were labelled by Yukl (1981) as "personal" form of power. The present results supported the general view that "personal" power has a positive effect on the leader-subordinate relationship. The high degree of intercorrelations among the referent, expert and reward power bases served to temper the previous discussions and tended to suggest that while referent power emerged as the dominant explanatory power base, its effective utilisation might be tied, to some extent, to the superiors' exercise of a combination of other power bases i.e. in this case, expert and reward power bases.

Although earlier findings (Warren, 1968) acknowledged that reward power shows less inner acceptance, the present correlational results indicated a high level of satisfaction with supervision. This power derives from control over positive or rewarding outcomes for subordinates is expected to be an effective means of influence to increase productivity in the organisation. Schopler and Layton (1974) held that the use of reward power is likely to increase the attraction between the manager and subordinates while coercive power is likely to decrease it. Too much emphasis of this power base, however, should be guarded against, since the withdrawal of positive sanctions is apt to result in the subordinates' reversion to their previous behaviour. Further, the effect of the inducement, even if continued, is subject to diminishing utility.

The legitimate power showed relatively lower correlation with the satisfaction with supervision. In the exercise of legitimate power, subordinates' responses tended to be dependent on the normative acceptance of the position and prerogatives of the organization at large including its leadership. The present result concurred with the conclusion made by Yukl (1981) that "position" power such as legitimate and coercive are less effective means of influence attempt.

The result for coercive power was not exactly consistent with hypotheses H1b. The study indicated that the amount of coercive power perceived to be held by a superior was not associated with supervisory satisfaction when it was earlier hypothesized to have negative association. However, the result failed to reach statistical significance. Past researchers also had mixed results with regard to this correlation. For example, Rahim and Buntzman (1988) – weak positive; Busch (1980), Hinkin and Schriesheim (1989) – negative. The coercive power which is derived from control over negative or punishing outcomes for other does not appear to be a suitable power base for dealing with subordinates. The traditionalists believed that punishment is ineffective and can lead to discontinuation of social interaction. The present results however, neither confirmed nor disproved the effectiveness of punitive treatments to get things done but it was obvious that this power exercise should not lead to subordinates' satisfaction. Moreover, people could not be coerced into a deep-seated acceptance of organizational requirements.

H2: Power Bases and Work Autonomy. The relationship as appeared in Table 4 (Note 5) between the perceptions of supervisory power bases and the perceived amount of work autonomy given was significantly distinct where in the relationship with all but coercive power had been significance. The relationship was strongest with reward power ( $r = .37$ ) followed by referent ( $r = .21$ ), legitimate ( $r = .19$ ), and expert power ( $r = .16$ ). As autonomy is related to the organizational control - the ability to control over work method, work scheduling and work criteria, a basic premise of the argument that follows is the association of interrelationship between power bases and control. Autonomy provides an opportunity for subordinates to exercise influence on decisions relating to their work. Hence, it enhances their relative ability to control in the organization. The present result pointed to the conclusion that superiors who were perceived to exercise coercive power would tend to exercise greater management control, possibly by application of autocratic techniques. The reason for this was not conclusive. Many plausible explanations were possible, but it was believed that superiors who exercised coercive power held to the traditional view that power has a fixed value, and a function of organizational structure and formal authority, unilateral and vertical in direction. Thus, subordinates' attempts to exercise greater influence may be seen as a threat to superiors' control and power. Furthermore, as the power gap between superiors and subordinates will even likely to increase as a direct consequence of punitive treatments, the subordinates tend to prefer to avoid participation. The above explanation is in similar vein as the conclusion made by Gardell (1977) about the relationship between work autonomy and industrial democracy.

The non-coercive power bases correlate better with the work autonomy. Strong relationship between reward power and work autonomy implied that those who exercised control over positive and rewarding outcome accorded greater work autonomy to the subordinates. Though the degree of commitment toward work by the exercise of reward power has been questioned (Warren, 1968; Gemmill & Wilemon, 1972) the rewards at least provide incentives for the subordinates to perform beyond the line of duty. The substantive outcome is visible only when one produces work beyond the normal expectations and control of the superior, otherwise reward is not necessary. The calculative involvement of subordinates to the application of this power underscores the importance of work autonomy in eliciting employees' responses. This conclusion was drawn from the assumption that people generally prefer greater work autonomy than less and that work autonomy can provide opportunities for greater outcomes. It appeared from this study that individual freedom and autonomy was contingent upon the exercise of reward power. In retrospect, it was inconceivable that reward power was exercised with no allowance for work autonomy in the present context.

The referent power which stems from a feeling on the part of the subordinates identify with the superior indicates subordinates' agreement with superiors in personal characteristics, decision style, etc. If the desire for work autonomy and the actual work autonomy given is aligned, the perception of referent power is reinforced. The

referent power base helps to build trust in a relationship (Busch, 1980). This trust is reciprocal and thus we would expect that those who exercise referent power will accord sufficient work autonomy to their subordinates.

The relationship between legitimate power and autonomy was significant although not strongly correlated ( $r = 0.19$ ). This power is more dependent on the authority relationship (position power) than the individually-based power style. This managerial style were regarded as “traditional” by many management theorists as the superior-subordinate relationship is perceived to follow rigid hierarchical line and employees tend to have little say in the conduct of their work.

It was interesting to note that even though the expert power was highly correlated with satisfaction with supervision, its correlation with work autonomy ( $r = 0.16$ ) was not as pronounced as one would expect. This finding plays down the importance of work autonomy in contributing to the satisfaction with supervision that lead one to think that work autonomy may not be as important as the perception of power style in ensuring employees’ satisfaction. It is obvious that professional expertise is not strongly related to work autonomy. Intuitively, if the subordinate perceived that the superior has greater expertise than himself/herself, he/she will tend to down rate his/her own capability at least in comparison with the superior’s. Such perception will suppress the motivation for anticipation in decision making, the reciprocal of this might also be true, i.e. if the superior perceive his/her subordinate to be incompetent and lacking in skills, little autonomy will be accorded to them. This finding is consistent with the work of Fiorelli (1988) and Bennett (1982).

Overall, the results agreed with hypothesis H2. However, the present result should be used with caution as the measurement of both construct was not based on the objective measurement but on individual perceptions. Individual differences such as desire for power equalization, inner motivation, etc might intervene in the relationship between power and work autonomy.

H3: Work Autonomy and Supervisory Satisfaction. The relationship between work autonomy and satisfaction with supervision was not as strong as one would expect ( $r = .23$ ). This was probably due to the reason that work autonomy and satisfaction with supervision was not very much a related concept. The former measured job characteristic from the perspectives of internalized pattern of self determination while the latter measured one’s feelings about the nature of supervision at work. Nonetheless, an important common element appeared to exist between them that explained their positive and statistically significant relationship. It was assumed that the common element would be the degree or quality of supervision. The right degree of perceived supervision is synonymous with the quality of supervision perceived. Conceptually, satisfaction with supervision may be considered, in special cases, as a consequence of work autonomy, but it is not the action of work autonomy itself. Work autonomy may result in satisfaction or frustration with supervision. Blake and Mouton (1964) suggested that subordinates should be given greater power in decision making if they are exceptionally skilled, the superiors should exercise power in decision making in times of crises or when subordinates lack skills and abilities. The work autonomy is valued to the extent that it is within the capability of the participant. Moreover, satisfaction with supervision has a more general meaning which includes factors other than quality and amount of supervision. It includes personal traits of the superior, his/her knowledge and specialized skills, habits and personal disposition. Thus it can be concluded that all other factors being equal, increased autonomy when accorded within the decision making capabilities of subordinates is accompanied by greater satisfaction with supervision.

H4: Power Bases, Work Autonomy, Supervisory Satisfaction and Age and Length of Service. Table 5 (Note 6) contains partial correlations between: (1) the superiors’ bases of power, work autonomy and the subordinates’ age controlling for length of service, and (2) the superiors’ bases of power, work autonomy and the subordinates’ length of service controlling for age. The partial correlations between expert, referent and reward power and subordinates’ age controlling for length of service were in the hypothesized negative direction (H4a). The relationship was not significant for the referent power. The coercive power was positively correlated with the subordinates’ age controlling for length of service as expected although not at a statistically significant level. The relationship between legitimate power and subordinates’ age controlling for length of service was not at all significant. The correlations between all the power bases and work autonomy with subordinates’ length of service controlling for age were very weak and insignificant statistically. Thus, the results provided no support for H4b.

The findings suggested that superiors may need to adjust the nature of power relationship when dealing with subordinates of different ages and times on the job. Between these two variables, age had a greater impact on the nature of the relationship. In general, the older the subordinate, the less responsive he/she is to the superior expert and reward power bases. The subordinates’ perception of the superior’s expertise diminishes with the subordinate’s age. This may be explained from enriched experience and knowledge as one matures with age which, serve to reduce the expertise gap between the subordinate and superior. The fact that expert power bases was insignificantly correlated ( $r = .06$ ) with subordinate’s length of service when controlling for age while age and

length of service were strongly correlated ( $r = .67$ ) seems to imply that length of service is of little consequence to the nature of the superior expert power relationship with the subordinate.

The results seemed to contradict the finding of Busch (1980) where length of service was found to be significantly and negatively related to the perception of expert power base of the superior. Several reasons could attribute to the differences in the results. First, the relatively higher educational background of the present respondents tends to play down the perception of expertise of superiors since the perception of expertise is confined to the job related activity. This is particularly true in the case when the subordinate has the technical and the professional background whereas the superior does not. Secondly, as one moves upward in organizational hierarchy with time, the nature of the job changes towards administrative roles where less emphasis is placed on the technical expertise and performance. Furthermore, a subordinate's perception of his/her expertise would not appreciable change as he/she moves from one company to the other so long as the kind of expertise required at the new company does not differ a great deal from the previous company. In such a case, the expertise gap between the subordinate and the superior is not perceived to be great even when the subordinate is new on the job. This explanation as well as the high job mobility among technical staff (average 2 previous jobs) lends support to the results that the present job tenure has little relevance as far as the perception of expert power base of the superior is concerned.

It is possible that the results may differ in the case of a technical staff who is entirely new on the job since his/her lack of experience and skill increases the tendency to view the superior higher on the expert power scale. It is also important to note from the Pearson correlational results in Table 4 that age of the superior alone does not ensure the effectiveness of superior expert power exercise ( $r = .07$ ), but the age gap between the superior and subordinate helps to increase the effectiveness of this power application ( $r = .20$ ).

Compared to younger subordinates, the older subordinates were less responsive to reward power influence styles. Though not identifiable in the present study, many logical explanations are possible: such as lower motivation as age increase, higher salaries, changes in the intrinsic needs of the older subordinates, etc. In comparison, younger subordinates are usually more dynamic, enthusiastic and excited about the job and the reward it would bring for increased effort than the older subordinates. Thus their reward power perceptions tend to be more positive.

Although the relationship between coercive power and age was not statistically significant, the direction of relationship implies that the older subordinate tends to be more sensitive to and dissentious with the coercive power influence. Additionally, the present study failed to find any relationship between age or tenure of office with work autonomy and job satisfaction.

## 6. Conclusion

In general, the results of this study in relation to the administration of industrial people were quite consistent with our hypotheses based upon other organizational studies involving qualified and professional people. The instruments used in the study were tested and found to be applicable to our work environment. The results provided some tentative, but hopefully useful guidance for industrial administrators.

Intercorrelations among the five power bases showed that French and Raven (1959) power bases are not mutually exclusive. Reward and referent power bases were the most closely related followed by expert and referent power bases. The results revealed that referent power, expert power and to some degree reward power and legitimate power are found to be in association with each form of power. On the other hand, coercive power was the least correlated with all other power bases and most often stands alone. Among all of the power bases, coercive power was most related to reward power. It indicates that reward and coercive power tend to be used interchangeably. Though not considered as a serious disadvantage, notable intercorrelations among the five power bases denote the difficulty of finding power typology which is both exhaustive and conceptually distinct.

In assessing the effectiveness of the various influence attempts, the results suggested that referent, expert and reward power should be emphasized to ensure subordinate acceptance. Coercive power should be minimised in any influence attempt except in situation that call for such approach (e.g. time of crisis, low performance etc). The position of legitimate power was the lowest among the non-coercive power bases in influencing subordinates' behaviour for the case of management of technical and professional staff. Comparative studies revealed an interesting difference in the rank ordering of bases of the superiors' influence attempts. While the present study and Rahim and Buntzman (1989) study ranked referent and expert power as the most favourable and legitimate power the lowest among the non-coercive power bases in eliciting subordinates' acceptance, results of a survey conducted on account executives, office managers and public administrators (Bachman, Smith & Slesinger, 1966) considered legitimate power as the most prominent or second in place. The results suggested a notion that the effectiveness of power influence does relate to the situation and context of the work environment.

The amount of autonomy given by superior was dependent on his/her willingness to delegate decision making down



to the subordinate. The manner in which, control over individual's conduct of work lives was found to influence the individual's perception of the source of control. Superior who was perceived to exercise coercive power tends to exercise greater management control – giving little opportunity for the subordinates to be personally responsible for a meaningful portion of their works. The reward power is often used in exchange for compliance by subordinates. The subordinate's performance beyond the line of duty is made possible under high autonomy situations. The referent power tends to build trust in the interpersonal relationship and thus naturally more autonomy will be given by the superior to the subordinates. The perception of referent power is reinforced when one's desire for work autonomy and the actual work autonomy given is aligned. Management style that firmly rests on the legitimacy of authority usually offers inadequate work autonomy as rigid hierarchical structure limits and inhibits the subordinates' freedom in the conduct of their work.

Even though autonomy is said to be highly favoured for job involvement and also aspiration toward increased work participation at both the personal and group level, the present study showed that work autonomy may not result in exceptionally greater satisfaction with supervision. It was concluded that the work autonomy will lead to greater satisfaction with supervision only if the subordinates feel that the degree of work autonomy is appropriate, within the capability of the subordinates and fits that psychological needs of the subordinates. Generally, the results of the study did support the idea that the employees' satisfaction with supervision is favoured by a design of jobs that allow for high autonomy and high demands on skills and cooperation.

The relationships between the superiors' bases of power and subordinates' age and length of service were generally weak. Nonetheless, the findings did suggest that superiors may need to adjust the nature of power relationship depending upon the subordinates' age. The perception and perhaps the effectiveness of reward and expert influence styles tended to diminish with the subordinate's age. Job tenure had little bearing on the perception of power bases. The study showed that the older superior tended to exercise least of reward power than the younger superior. It was also found that the nature of superior-subordinate expert relationship was more distinct when the age gap between them increases. As much as the result tended to suggest, the researchers did not presuppose that age per se was the crucial factor which explained the nature of this relationship. It was rather the constellation of variables which covary with age such as pay, levels of hierarchy in the organization, job tenure, life orientation, knowledge, maturity etc that are likely to cause the difference in the perception and effectiveness of power style.

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### Notes

Note 1. Supervisory Power Bases, Work Autonomy and Satisfaction with Supervision

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### Bases of Supervisory Power

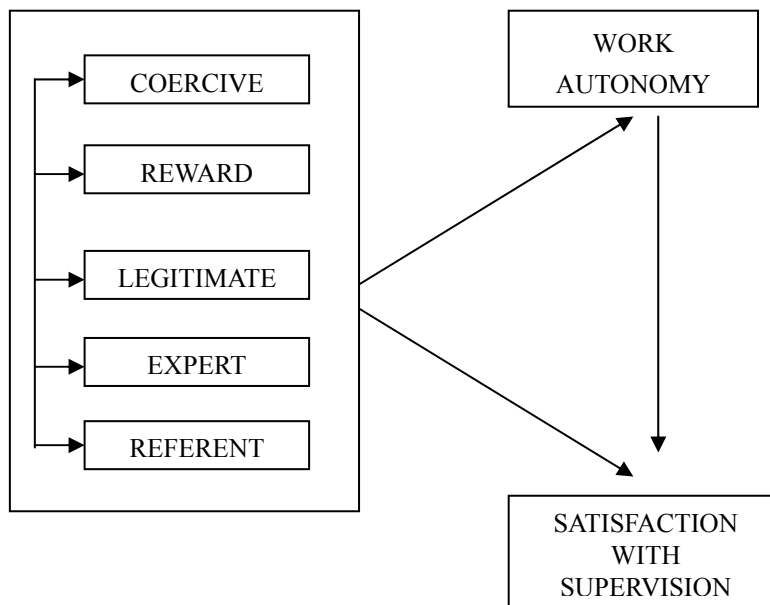


Figure 1. Supervisory Power Bases, Work Autonomy and Satisfaction with Supervision

Table 1. Factor Structure Matrix for Varimax Rotated Factor Solution

Item	Power Bases/Items	EX	RE	Factors			LE	
				RF	CO			
No		I	II	III	IV	V	h	
	I. <u>Expert Power</u> (EX)							
3.	I approach my superior for advice on work-related problems because he/she is usually right.	<u>.46</u>	.10	.12	-.08	.15	.28	
5.	When a tough job comes up my superior has the technical “know how” to get it done.	<u>.73</u>	.09	.14	.00	.08	.57	
7.	My superior has specialized training in his/her field.	<u>.65</u>	.26	.13	.13	.11	.54	
10.	My superior <u>does not</u> have the expert knowledge I need to perform my job.	<u>.62</u>	.07	.11	.05	.10	.50	
17.	I prefer to do what my superior suggests because he/she has high professional expertise.	<u>.65</u>	.10	.16	-.01	.14	.56	
18	My superior has considerable professional experience to draw from in helping me to do my work.	<u>.78</u>	.19	.19	-.02	.07	.70	
	II. <u>Reward Power</u> (RE)							
4.	My superior can recommend me for merit recognition if my performance is especially good.	.19	<u>.53</u>	.17	.11	.22	.42	
11.	My superior can provide opportunities for my advancement if my work is outstanding.	.20	<u>.64</u>	.19	.10	.08	.56	
15.	My superior <u>cannot</u> get me a pay raise even if I do my job well.	-.05	.39	.24	.18	.00	.39	
22.	If I put forth extra effort, my superior can take it into consideration to determine my pay raise	.24	<u>.68</u>	.20	.13	.06	.60	
24.	I want to develop a good interpersonal relationship with my superior.	.16	.20	.16	.18	.17	.20	
27.	My superior can get me a bonus for earning a good performance rating.	.07	<u>.74</u>	.23	-.02	.01	.63	
28.	My superior can recommended a promotion for me if my performance is consistently above average.	.18	<u>.82</u>	.15	.10	.06	.74	
	III <u>Referent Power</u> (RF)							
1.	My superior has a pleasing personality.	.15	.17	<u>.68</u>	.06	-.06	.54	
12.	I don’t want to identify myself with my superior.	.12	.19	<u>.67</u>	.04	.16	.54	

Table 1 (Continued)

Item No	Power Bases/Items	Factors					
		EX	RE	RF	CO	LE	
		I	II	III	IV	V	h
19.	I admire my superior because he/she treats every person fairly.	.33	.32	<u>.70</u>	.02	.07	.71
21.	I like the personal qualities of my superior.	.24	.20	<u>.66</u>	.11	.05	.56
25.	My superior is not the type of person I enjoy working with.	.26	.26	<u>.52</u>	.02	.11	.63
<u>VI. Coercive Power (CO)</u>							
2.	My superior can take disciplinary action against me for insubordination/disobedience.	.03	.08	.07	<u>.48</u>	.21	.30
9.	My superior can fire me if my performance is consistently below standards.	-.03	.00	.00	<u>.78</u>	.10	.62
14.	My superior can suspend me if I am habitually late in coming to work.	.05	.13	.07	<u>.44</u>	.08	.34
16.	My superior can see to it that I get no pay raise if my work is unsatisfactory.	-.08	.17	.00	<u>.65</u>	.00	.47
20.	My superior can fire me if I neglect my duties.	.06	.00	.09	<u>.77</u>	.00	.60
<u>V. Legitimate Power (LE)</u>							
6.	It is reasonable for my superior to decide what he/she wants me to do.	.26	.04	.05	.00	<u>.48</u>	.43
8.	My superior is justified in expecting cooperation from me in work related matters.	.04	.11	.18	.20	<u>.54</u>	.42
13.	My superior's position entitles him/her to expect support of his/her policies from me.	.12	.10	.14	.12	<u>.68</u>	.57
23.	My superior's position does not give him/her the authority to change the procedures of my work.	.13	.11	-.13	.12	<u>.45</u>	.35
26.	I should do what my superior wants because he/she is my superior.	.16	-.13	-.05	-.15	<u>.54</u>	.47
29.	My superior has the right to expect me to carry out his/her instructions.	.07	.10	.04	.09	<u>.60</u>	.39
Eigenvalues		6.7	2.4	2.0	1.2	1.2	
Percentage of variance explained		23.1	8.1	6.8	4.3	4.1	

Table 2. Reliability of Scales: Power Bases, Work Autonomy and Satisfaction with Supervision

Scales	No. of Items	M	SD	Item-Total Correlation	Cronbach Alpha
Expert	6	3.45	.76	.46 to .71	.84
Reward	5	3.82	.75	.57 to .76	.85
Referent	5	3.56	.77	.57 to .72	.84
Coercive	5	3.71	.71	.40 to .60	.76
Legitimate	6	3.88	.53	.37 to .54	.73
Work Autonomy	9	3.82	.58	.42 to .74	.85
Satisfaction with Supervision	18	13.10	4.30	.29 to .64	.86
SDS	10	6.26	2.00	-	-

Table 3. Multiple Regression Analysis: Power Bases and Satisfaction with Supervision

Dependent variable: Satisfaction with supervision

Predicted Variables	b	Standard Error	Beta	T Value
Legitimate	-.348	.451	-.043	-.772
Coercive	-.049	.323	-.008	-.152
Referent	2.689	.359	.486	7.486 *
Expert	1.055	.350	.188	3.020 **
Reward	.818	.364	.142	2.248 **

F = 34.749

Significance F &lt; 0.0001

R (adjusted) = .447

Intercept: a = - 1.738

\* p &lt; .0001

\*\* p &lt; .05

Table 4. Pearson Inter correlations of Main Variables of Interest

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1 Expert Power	1.00	.41	.48	.07	.33	.16	.47	.07	.11	-.16	-.17	.20
2 Reward Power		1.00	.53	.21	.21	.37	.47	-.08	.04	-.18	-.15	.08
3 Referent Power			1.00	.14	.20	.21	.64	.01	.04	-.12	-.08	.11
4 Coercive Power				1.00	.16	.05	.09	.03	.10	.12	.19	-.06
5 Legitimate Power					1.00	.19	.15	.03	.00	.00	-.02	.04
6 Work Autonomy						1.00	.23	.03	.03	.04	-.06	.06
7 Satisfaction with supervision							1.00	.02	.10	-.01	.00	.03
8 Superiors' Age								1.00	.48	.34	.34	.62
9 Superiors' Job Tenure									1.00	.36	.49	.14
10 Subordinates' Age										1.00	.67	-.52
11 Subordinates' Job Tenure											1.00	-.26
12 Superior-subordinate Age Difference												1.00

Note:  $r's > .11$  is significant at  $p < .05$   
 $r's > .21$  is significant at  $p < .001$

Table 5. Partial Correlations Controlling for Subordinates' Age and Time-On-Job

	Age Controlling for Time-on-Job	Time-on-Job	Controlling for Age
Expert	-.16*		.06
Reward	-.11**		-.04
Referent	-.08		-.00
Coercive	.05		.05
Legitimate	.00		-.01
Work Autonomy	.00		-.04

\* Significant at .01 level (One-tailed test)

\*\* Significant at .05 level (One-tailed test)

# Measuring Human Capital with Activity Based-costing and Economic Value Added

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## **Abstract**

It is a big problem how to measure human capital accurately, which has puzzled economists for a long time. There is not an effective way to calculate the cost of human capital until now. In recent years, activity based-costing (ABC) and economic value added (EVA) have been well developed and applied in many industries in western countries. They are advanced theory of cost calculation and may provide us useful tools to measure human capital. The paper examined the cost characteristics of human capital with the theory of ABC. Key activities in the process of human capital's development were defined. Resource costs were allocated accurately and the procedure of human capital's calculation was proposed. It provides us a new idea to measure and manage human capital and will do some help in further studies.

**Keywords:** Human capital, Activity based costing, Economic value added, Cost pool

## **1. Introduction**

With twenty year's reform and opening-up, China has made a lot of progress in economy and technology. Especially in the time of new economy, the development of science, technology, and capital accumulation urgently require innovations in the management of human resource. But until now there is not significant progress in the measurement of human capital. In fact, there are no effective methods to calculate human capital stock (J. Wang, 2001). This has influenced the research on the relationship between human capital and economic growth.

How to measure human capital more accurately? How to reflect the real value of human capital and well manage it? These have become an important question. In this paper, human capital was effectively analyzed with the principles of activity based costing (ABC). Human capital stock was well calculated and a new idea of management was brought up.

## **2. Methods of human capital measurement**

### *2.1 Concept of human capital*

"Human capital" was first introduced by T.W. Schultz, a famous economist, in 1960. Becker, Gary (1987) thought that human capital not only meant ability, knowledge, skill, but also meant time, health, and life. The definition given by Doctor Li Zhongmin (1999) was that human capital was a kind of value that existed in the body, could act on goods or service to increase their utilities, and then shared benefit from it. Wang Jinying(2001) also thought that human capital was composed of knowledge, ability, health and so on. It existed in human bodies, could be factored into goods or service to increase their utilities, and then obtained earnings from it.

These definitions described human capital from its content, function, and utility. Some even specified the components. Wang Jinying summarized human capital into five parts: general education capital, specialty capital, experience capital learning by doing, health capital, capital of migration and job-selection. These are the bases of our measurement.

### *2.2 Methods of human capital measurement*

The measurement of human capital is a problem which has puzzled economists for a long time. According to the



need of research and the acquisition of data, people studied it from different points of view. Schultz used indirect estimating method to measure the ability of farm workers, the change of children's quality stock, and the change of quality stock in education and health. This method showed the change of human capital from different sides, but it could not measure the change of total stock (Yan, Duan, 2001, p.100-103.). Doctor Li Zhongmin (1999) suggested using output method that is to measure human capital by means of salary. He believed that human capital could be measured indirectly by practical results (that is absolute salary in market economy) in a certain system environment and by efficiency principle. He established a model to calculate human capital:

$$Z = \sum_{j=1}^n Z_j = \sum_{j=1}^n \left[ \sum_{i=1}^m \omega_i / (1+r)^i \right]_j \quad (1)$$

Here,  $Z$  is the discount value of human capital stock.  $\omega_i$  stands for the expected income in the year  $i$ , and  $r$  is the discount rate.

There are many strict hypotheses in this model. For example, each person invests in human capital only once a life and other capitals are learned by doing. The measurement is based on one country that doesn't trade with other ones. Human capital before 16 years old and after 60 is regarded as zero. These hypotheses could not be met completely in real life, so he modified some of them. But even so, the human capital hidden in bodies is always not consistent with supplies of it. And this method does not consider differences between different workers. So output method does not get widely used.

Educational year method is another way to measure human capital. According to this method, labor force is classified first, and then sums them on a weighted basis of human capital characteristics of different labors. The model is as follows (Wang, 2001):

$$H_t = \sum_{i=1}^6 HE_{it} \times h_i \quad (2)$$

Here,  $H_t$  stands for total stock of human capital in the year  $t$ .  $HE_{it}$  is the amount of labors with educational level  $i$ .  $h_i$  is the years of education of the people with level  $i$ , and  $i=1,2,3,4,5,6$  stands separately for college, academy, senior high school, junior high school, elementary school education, and illiterate or semiliterate.

People using this method believe that there is positive correlation between years of education and investment in human capital, cumulative capital learning by doing (Yoram, 1967, p.352-365), and labor's income (Jacob, 1958, p.281-302). So they think the year of education is one of the most representative factors in human capital stock. But this method treats marginal efficiency of different education equivalently. It couldn't recognize the different educational attainment.

All these methods calculate human capital as a whole. They do not make a thorough analysis about its components. We believe that the components that build human capital have many differences in characteristics. So the accuracy of results will be affected if calculating it in this way. Here we try to use the principles of ABC to analyze and manage human capital.

### 3. Managing human capital with ABC

#### 3.1 The basic principle

Activity based costing is a new management concept and approach developed in the late 1980s in the west and first applied in advanced manufacturing businesses in the early 1990s. It is an activity-focused costing and management system which provides relatively accurate information on product cost and increases the scientific nature, effectiveness of decision-making and planning through the identification, accounting of activity cost and choice of cost drivers. At the same time, the following up of product-related activities provides valuable information for the elimination of "non-value-added activity", improvement of "value-added activity", optimization of "activity chains" and "value chains", and increase "customer value". As a result, loss and waste are minimized, and the management of a business is improved (Wang, Jin, Ke, 2000, p.121-155). Here, "activity" means resource-consuming activity that companies carry out for certain purpose. It builds a bridge over resource and cost objective. And it is the basic element of activity chains.

We can measure human capital in the same way as we calculate product cost.

When measuring human capital with ABC, the basic principle is that products (i.e. human capital) consume activities and activities consume resources. Different from conventional methods, the method's focus is on the activity. It first pools resource cost to activities based on the consumption of resource. Then it allocates activity cost to human capital based on activity drivers. Figure 1 shows the principle of measuring human capital with ABC.

The basic procedure is as follows (Wang, 2001):

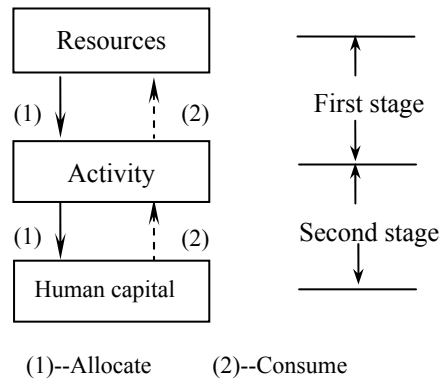


Figure 1. Principle of measuring human capital with ABC

- 1) Set up each activity and judge what the important activities are, which need to be further subdivided and which not, which can be combined into other activities.
- 2) Collect resource cost, and pay attention to the resources associated with product variety and those having low relevance to traditional assignment benchmark. Then, allocate resource cost to each activity.
- 3) Identify key activities and set up activity centers to develop a homogeneous cost pool.
- 4) Select representative activities for centers to determine the allocation rates of cost pools.
- 5) Allocate cost to products to obtain the cost of human capital.

### 3.2 Identifying key activities in human capital's development

When identifying and pooling activities according to the flow of production, we may find that there are several dozen, hundred, or even thousand activities. This seems too complicated for ABC. So it is very necessary to identify key activities and pool small activities. Simultaneously, two points need to be paid attention to:

- 1) Avoid definition with too much restriction, for this definition not only couldn't help us obtain useful information, but also would bring us a more complex analysis.
- 2) Avoid too broad definition, for this definition couldn't clearly tell us the opportunity of improvement.

In term of these principles, we should identify and define key activities first when calculating the human capital. From above we know that human capital can be divided into general education capital, specialty capital, experience capital learning by doing, health capital, and capital of migration and job-selection according to the forms of investment. We also find that general education capital and specialty capital are both education capital from analyzing the characteristic of these parts. If we regard these five parts as five separate activities, we can combine two small activities — (general education capital and specialty capital) — into a big one, i.e. education capital.

Thus four key activities are identified in the process of human capital measurement. They are education, learning by doing, health, migration and job-selection.

### 3.3 Allocating resource costs to human capital

Activity "education" is closely related with years of education. So we may consider using educational year method to measure the cost of this activity that labors consume, and then build cost pool 1.

As for experience capital learning by doing, we are considering using economic value added (EVA) method to solve this problem. Experience capital is the ability and experience which people accumulate in the course of learning and working. It is very abstract and can not be measured accurately with traditional quantitative method. So we want to use economic value added to calculate it.

EVA, developed by Stern Stewart and Co., is viewed as an estimation of a company's true economic profit that differs from accounting profits (Lokanandha, Raghunatha, 2006, p.1-7). Based on residual income (RI), Stern Stewart made some adjustments on net operating profits after tax (NOPAT) and invested capital to eliminate the accounting distortions caused by GAAP (Stewart, 1995, p.117), and then put forward EVA:

$$EVA = (NOPAT + Adj_{NOPAT}) - k \cdot (Capital + Adj_{Capital}) \quad (1)$$

It shows that EVA equals to net operating profits minus a charge for cost of invested capital.  $Adj_{NOPAT}$  and  $Adj_{Capital}$  represent the adjustments made by Stern Stewart on NOPAT and capital, and  $k$  refers to the rate of capital cost. Here, capital cost refers to opportunity cost.

In fact, EVA measures the company's value creation from the point of view of economics. It is believed that EVA is the real method to capture the true economic profit of the company (Dodd, Johns, 1999, p.13-18). Some researches showed that EVA had more explanation on the company value and stock returns than traditional accounting indices (Chen, Dodd, James, 2001, p.65-86; Dodd, Chen, 1996, p.26-28; O'byrne, 1996, p.116-125). Some proved with economics that incentive scheme based on RI or EVA can effectively eliminate financial risk and reducing agency cost, then optimizing incentive contract (Reichelstein, 1997, p.157-180; Dutta, Reichelstein, 1999, p.235-258).

EVA created by labors can well reflect one's ability and experience accumulated in the work. And through the concept of EVA, people realize that all the resources are not free. So they must make best use of them to maximize the utility of these resources and capitals. So we consider using the increment of EVA to reflect changes in labor's ability and experience in a certain period and get cost pool 2.

Health capital is the basis of other types of human capital. It means a person's physical force, energy, and health condition. Always a person's health condition will have direct effect on the efficiency of capital investment. And health capital mainly relies on people's investment in this item. So we can get the cost due to this activity through gathering the information about people's investment in health. Thus cost pool 3 forms.

Capital of migration and job-selection is the capital occurring in the course of people's migration and job-selection. Total costs of this activity, i.e. cost pool 4, consist of direct cost and opportunity cost of this item.

Finally, we can calculate human capital according to activity cost consumed in the development of human capital. The basic procedure is shown in figure 2.

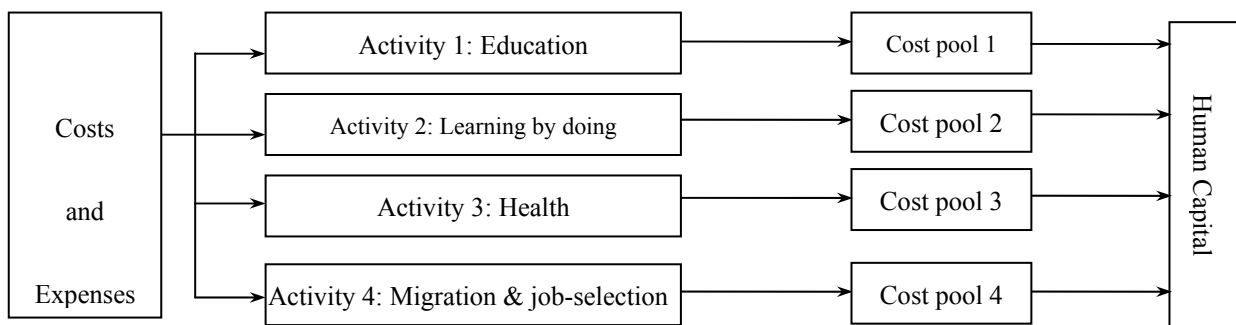


Figure 2. Procedure of human capital's calculation

Measuring human capital in this way solves the problem that traditional methods couldn't distinguish cost characteristics of human capital and provides relatively accurate information about it. It also improves the process of costing and analyzing, and further reveals the role that resource and activity play in the development of human capital.

#### 4. Conclusion

Human capital's measurement and management were analyzed from a new angle—activity based costing. ABC provides valuable information for all kinds of decisions such as product pricing, human capital investment, and market entry or exit through relatively accurate costing. The paper used the theory of ABC to analyze the cost characteristics of human capital. It identified key activities in the development of human capital, allocated resource costs to activities and human capital according to respectively resource drivers and activity drivers.

It helps to analyze the flow of resources, provide bases for the division of cost control, and find ways to improve human capital. It provides us a new idea to measure and manage human capital. But it is only a preliminary idea. The following questions should be observed:

- 1) EVA is a western concept and successfully used in western companies. But in China, enterprises seldom take it into account, for there are many differences between western and oriental business in culture, law, degree of automation, management tools, concepts, and skills. These differences have given rise to a number of special difficulties in implementing EVA in Chinese enterprises.
- 2) Limited by time, we didn't prepare a real case. But this method provides relatively accurate information on

human capital and gives some advice on how to well manage human resource. It will support people's decision of human capital investment.

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# Research on the Development of the Recycle Treatment Industry of the Municipal Solid Wastes under the Background of China's Urbanization

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## Abstract

The recycle treatment of the municipal solid wastes (MSW) has become an integrated part of the development of recycle economy, it not only helps to alleviate the ecological environment problems brought by a large number of the MSW in the fast development of urbanization in China, but also can obtain urban economic development and some resources which are necessary to residents' life through various kinds of recycle treatment measures. Based on the urbanization development and current situation of the MSW's disposal in China, it have analysed the developing prospect of the recycle treatment industry of the MSW in China, and have structured the social supporting system with three parties' participation which include government, enterprises and residents, so as to promote the development of recycle treatment industry of the MSW in China.

**Keywords:** Urbanization, MSW, Recycle treatment

## 1. Introduction

Since 1990s, in the western developed countries, positive practice of recycle economy has already become the mainstream of economic development, and has obtained remarkable achievement. The trend of the world recycle economy's development embodies mainly in the following aspects such as consummating the legislation of recycle economy gradually, perfecting economic policy of recycle economy and enterprises' active practice of carrying on recycle economy, etc.. However, compared with the gradually perfecting situation of foreign recycle economy' development, the development of China's recycle economy still remains in the starting stage of exploring, the scope of recycle economy's development needs expanding badly, the depth demands urgent improvement. For that, this article analyses the developing prospect of the recycle treatment industry of the MSW in China, and structures the social supporting system with three parties' participation which include governments, enterprises and residents, so as to promote the development of recycle treatment industry of the MSW in China.

## 2. Urbanization development and current situation of the MSW's disposal in China

The cities' development can create and gather enormous material wealth and spiritual wealth for a nation. The statistics shows that in China, more than 50% of the industrial output, more than 70% of gross national product, nearly 80% of state finance and tax revenue and 85% of the third industry 's added value evolves from cities, more than 90% of the high education and scientific research strength centres in cities(Wang & Luo, 2005). The city economy's gathering and inducing effects have become obvious day by day. Since the reform and opening-up, China's economy has been keeping fast and continuous development, therefore quickening the urbanization process. During the period of 1995-2005, China's average annual growth rate of urbanization is 0.8%, after the positive financial policy was implemented in 1998, the speed of urbanization was obviously accelerated. Fig.1 shows the urbanization rate of China during 1995-2005. it is not difficult for us to predict that the urbanization rate of China will still keep fast growth Within period in the future .

Fast development of urbanization, on the one hand, can give full play to the advantage of the urban gathering, promote the constant development in many aspects like social economy, culture and so on. But on the other hand, cities have a large amount of people who have consumed a large number of materials and resources in the relatively narrow and small space, therefore a large number of the MSW have been produced and have gone beyond cities' self-purifying ability, as a result of that, a series problems of urban ecological environment have been brought out. So, during the process of quickening the development of urbanization, we should give full play to the advantage of the urbanization in economic and social development, and try to strengthen the construction of environmental-friendly city simultaneously, so as to make the urban economy develop faster and make the urban environmental construction more graceful.

In 2004, the volume of the MSW collected and transported in China reached 155 million tons, and there were

altogether 559 MSW disposed factories, among which, there were 444 landfill yards, 61 factories of piling, 54 power plants generating electricity through burning, innocuous handling capacity was only 80 million tons, the innocuous handling rate was about 52.1%(2005). In those western developed countries which are pursuing recycle economy actively, the treatment of the MSW is being developed towards reduction, recycle treatment and innocuous, and remarkable achievement has been obtained. Take Germany as an example, family offal's circulation utilization ratio has already been up to 49% in 2000, among them, the rate of recovery of packing bottle of glass was 82%, the rate of recovery of the paper packing article was 77%. Therefore, we can draw a conclusion that the level and ability of the MSW disposal in China are very limited, and they demand urgent promotion.

### **3. The prospects of China's development in the recycle treatment industries**

The outline of the Eleventh Five-year plan for national economic and social development in the People's Republic of China, which was passed at the fourth meeting of The Tenth National People's Congress, brings forward clearly that we will build a national economic system with low input and high output, low consumption and less discharge, the ability to circulate and sustain, and build a resource-conserving, environment-friendly society", at the same time, it has proposed a series of measures to develop recycling economy, this has fully reflected China's hope and resolution to change the economic growth mode and develop the recycling economy.

It is the important component of China's development in recycle economy to promote the recycle treatment of the MSW. To realize the industrialization of recycle treatment of the MSW, it actually means following the theory of recycling economy in practice. It is necessary to fully excavate the economic benefit of recycle treatment of the MSW while guaranteeing its environmental and social benefit; and it is also important to constantly improve the recycle treatment rate of the MSW While guaranteeing the innocuous disposal and reduction of the MSW. Finally the recycle treatment level of the MSW will be improved, and therefore promoting the development of recycling economy.

"Rubbish is resources misplaced", this statement has already got more and more approval. In the western developed countries, 45% of the output of steel and iron is produced with abolished steel and iron material, 35% of the output of copper, 22% of the output of plumbum, 30% of the output of zinc, 35% of the output of paper are all produced by utilizing old and useless material. According to statistics, recycling 1 ton reproducible resources means reducing 4 tons rubbish handling capacity; recycling 1 ton abolished steel and iron can avoid exploiting 20 tons various kinds of ore as well as economize 1.2 tons standard coal for steel and iron-making; The waste paper can produce the good paper, thus economizing the timber; The waste plastics can produce the plastic products, so that the petroleum can be economized. (Luo, 2002) Carrying on recycle treatment to the reproducible material in the MSW is undoubtedly an important way to build a "conservation-oriented society" and develop recycle economy.

According to international trend and domestic practice, reclaiming to reuse, burning to generate electricity and compost are the three most common recycle treatment measures of the MSW. For a long time, the main way of treating the MSW of China is landfill, other ways of recycle treatment are slowly developed. In 2004, there are 444 hygiene landfill yards in China which deal with 68,889,000 tons MSW altogether, taking 85.2% of all rubbish handling capacity. Landfill causes problems such as wasting land resources, not dealing with the MSW thoroughly, being apt to lead the secondary pollution, and so on. Moreover, through the way of landfill, some useful material among the MSW might be buried. Therefore, comparatively speaking, though landfill is a simple and easy way to deal with the MSW, and its cost of short-term investment is relatively low, in the long run, recycle treatment measures like reclaiming to reuse, burning to generate electricity and compost can reduce the pollution caused by the MSW to a larger extent, at the same time, they can obtain some resources which satisfy city development and residents' living requirements.

Reclaiming to reuse the MSW include the procedures such as collecting, processing, selling and reusing the useful material in the rubbish. With the improvement of economic development and resident's consuming level, there are more and more useful materials (take paper, metal and plastics as representatives) in the MSW. Therefore, through reclaiming to reuse, renewable resources can be obtained from the MSW, and higher economic benefits can be produced. In the developed countries, the ratio of reclaiming to reuse the waste steel and iron, waste copper and waste rubbers is all up to 90% while the ratio of reclaiming to reuse the waste steel and iron in China is only 45%, the ratio of reclaiming to reuse waste copper, waste rubbers is 30% and 40% respectively(2005). According to the incomplete statistics, every year in China, there are nearly 5 million tons of waste steel and iron, 200,000 tons waste non-ferrous metals, 14 million tons of waste paper, and there is also a large amount of waste plastics and waste glass which is reclaimed and reused incompletely. As a result, the yearly value of the regenerated resources, which could have been recycled if they had been reclaimed, is up to 300 to 350 hundred million yuan. Therefore, China's recycle market of the MSW has a bright future, the potentiality of regenerated resources industry's development is enormous.

The outstanding advantage of generating electricity through burning the MSW is that it can deal with the MSW more completely, and moreover, it can offer electric energy and heat energy without taking up much land resources. However, generating electricity through burning the MSW expect relatively much combustible content in the rubbish, and it may cause secondary pollution. Besides, the enormous investment in facilities is another problem. At present, the quantity of the power plants generating electricity through burning the MSW, which has already been built up and come into operation in China, is relatively less. But in some large and medium cities and coastal cities, considering factors such as the scarcity of land resources, the short supply in electricity and the great improvement in relevant technology, generating electricity through burning the MSW has already been classified as one of the important ways to dispose the MSW.

The compost refers to the biochemical course of utilizing the technology of fermenting microorganism to promote the degradative organic matter to transform to the steady humus. It is suitable for the MSW with the higher content of organic matter, for instance coal ash, kitchen remains, fallen leaf, etc.. After the MSW is converted to compost, they can be directly used as the fertilizer in agricultural production. Compared with chemistry fertilizer, the MSW compost has relatively low harm whereas its efficiency is relatively bad. The materials like metal, glass and plastics in the MSW will reduce the quality of the compost products so that the sale of the compost products will be influenced. Therefore, the compost technology has relatively higher requirements to the MSW's classification and selection. In recent years, some cities have actively developed the MSW's classification and selection, popularized the mechanized operation, improved the technology of compost, as a result of that, compost has got new development and more and more close attention.

To sum up, compared with fast-developing process of urbanization, the recycle treatment of the MSW in China lags behind seriously, which makes a large number of useful resources in the MSW unable to get effective use in time, and makes them become the trouble of destroying the urban ecological environment instead. Therefore, accelerating the speed of changing the situation that landfill is still considered as the leading status in all the ways of disposing the MSW in China, developing some measures of recycle treatment such as reclaiming to reuse, generating electricity through burning the MSW, compost, etc. according to the practical circumstances, newly building or reconstructing the facilities for recycle treatment of the MSW, advancing the recycle treatment industry of the MSW towards the directions of scaling, intensifying and modernization, should become the most important thing of the MSW management of our country at present and even in a very long time of the future.

#### **4. Discussions on tactics which promote the development of recycle treatment industry of the MSW in China**

As the important component of recycle economy's development, it is a systematic engineering to promote the development of recycle treatment industry of the MSW, it is necessary to carry on the policy planing from the following aspects like governments, enterprises and urbanites progressively, the social supporting system for recycle treatment of the MSW should be set up, and a series of measures such as takeing government's relevant regulation and policy as the leading factor, and taking enterprises' extensive participation and residents' active cooperation as support, should be adopted so as to promote and realize the industrialized development of recycle treatment of the MSW.

##### *4.1 Governments accelerate the speed of making the relevant regulation and policy, building a good outside environment for development*

The government's relevant departments should play a leading role consciously, improve administrative efficiency, establish the guidelines of keeping harmonious relations between man and nature, establish the strategy for the development of

resource-conserving and environment-friendly cities, strengthen the comprehensive utilization and conservation of resources, especially the utilization of the re-useable material in the MSW, do well the comprehensive tackling and programming of cities' environment, push the all-round development of recycle treatment industry of the MSW.

(1) Set up sound laws and regulations, standardize the relevant behavior subject of recycle treatment of the MSW. In the current laws and regulations system, those closely related to recycle treatment of the MSW mainly include, The Management Rule of Urban Appearance and Environmental Sanitation which was released by The State Council in 1992, the Management Method of the MSW which was released by the Ministry of Construction in 1993, the Prevention and Tackling Law of the Environmental Pollution by the MSW in P.R.C which was released by the National People's Congress in 1995 and revised in 2004. Besides, each local government has made some local rules of law according to the practical development. However, many problems still exist in the formulation and execution of these laws and rules. First, some of the laws and rules are so outmoded that they are unable to solve all sorts of new problems appearing in the fast development of urbanization. Second, it is difficult to restrict and standardize the relevant subjects' behavior because of the incomplet execution of laws and rules. Third, some fuzzy concepts in the

laws and rules make the right, responsibility and profit of the behavior subjects not well-defined. Therefore, according to the new trend of the development of the MSW and the defect existing in laws and rules, we should gradually revise and perfect the relevant clauses of the laws and rules progressively, strengthen the enforcement of the existing laws and rules, and insist on the principle of "there must be laws to go by, the laws must be observed and strictly enforced, and law-breakers must be prosecuted", so as to give full play to the function of the laws and rules.

(2) Make the perfect policy system, encourage the multi-investing subjects to participate in the recycle treatment of the MSW. The essential prerequisite to realize the recycle treatment of the MSW is to make it profitable. The cost to revert the renewable material in the MSW into the available resource is relatively high, which makes the economy of the relevant products relatively bad, and makes the market competitiveness not strong. In addition, because the construction and operation cost of the recycle treatment facilities of the MSW is usually relatively high, and funds that government's financial budget could allocate to the sanitation department and urban construction department are limited, as a result of that, it is difficult to fulfill the construction and maintenance of some recycle treatment facilities. Therefore, in virtue of the propping up from government's perfect policy system, we must adopt economic means, such as finance, tax revenue, etc., extensively absorb the foreign and private capitals to enter the recycle treatment industry of the MSW, optimize the mechanism of market competition, foster the good serving market, encourage scientific and technical innovation, create the market environment of equity, justice and open, lead the recycle treatment industry of the MSW to develop in a healthy and orderly manner.

#### *4.2 Enterprises' extensive participation make them become the mainstay of recycle treatment of the MSW*

The enterprises of environmental protection type are concrete implementers of recycle treatment of the MSW, they should become the mainstay of the recycle treatment industry of the MSW. According to the request for the development of recycle economy, enterprises can carry on activities of producing and managing from transverse and vertical angles, and actively launch the recycle treatment of the MSW.

From the transverse angle, enterprises of environmental protection type should enter the ecological industrial park and new high-tech industry garden initiatively, fully utilize the characteristic of closed circulation of substances in industrial system, through the transverse coupling and resource-sharing between different enterprises or industrial procedures, find enterprises' upriver suppliers of raw materials accurately, and find the wastes analyst of the low reaches at the same time. According to the interdependence relation between different enterprises, form relevant industry clusters, set up food chain and food network of the industry ecosystem in the garden, so as to achieve the goal to turn the negative benefit of pollution into positive benefit of resources (2005).

From the vertical angle, enterprises should pursue cleaner production and green operation from the inside, carry out the thought of recycle economy in all respects of the production and management and bring them into effect, launch from the respects like product design, technological progress and scientific management and so on, economize resources and protect the environment to the maximum extent. In addition, enterprises should also use renewable raw materials and products to carry on the production and management as much as possible, take the initiative to implement the system of producers taking responsibility, actively do a good job of reclaiming to reuse of products, form the material circulation in which enterprises themselves are taken as the centre to enclose.

#### *4.3 Residents' active cooperate establishes the mass foundation of recycle treatment of the MSW*

The urban residents' daily life and relevant activities are closely linked with the MSW. Firstly, the MSW directly root in the urban residents' daily life and relevant serving activities. Secondly, the way that residents handle the MSW will influence the methods and efficiency of the treatment to the MSW and vice versa. Therefore, it is reasonable for the urban residents to be obligated to actively participate in the activities like collecting and classifying the MSW. Meanwhile, because of the external diseconomy of the MSW's disposal, urban residents are unwilling to take the initiative to undertake these duties. All in all, on the one hand, propagating education and moral remonstration to the urban residents should be launched, and the serious harm caused by the MSW should be expound with the help of the public opinion and news media, the important meaning of categorised collection of the MSW should be propagated, and the urban residents should be encouraged to actively participate in the categorised collection of the MSW. On the other hand, the government organs could adopt the methods of legislating, administration, collecting charges and taxes, carry on necessary restriction or encouragement to the urban residents' behaviors of disposing the MSW. As a result of that, the activity of abandoning the MSW without classification could be limited, and the categorised collection and reclaiming to resue the MSW could be promoted (Zhang, 2004).

### **5. Conclusion**

Realizing the recycle treatment of the MSW in China, on the one hand, can help to solve the urban ecological environment problems that the MSW causes, and have very strong urgencies, on the other hand, can help to obtain



some resources necessary for city development and residents' life and make the market development's prospect brighter. However, it is a long-term evolution for the development of the recycle treatment of the MSW, it relies on the support of various aspects, such as politics, economy, culture, science and technology, etc.. Therefore, we should take the actual development in different places into consideration, adjust measures to local conditions, choose the suitable ways of recycle treatment and actively popularize them, perfect the relevant supporting system, so that the industrialized development of recycle treatment of the MSW in China could be realized in the end.

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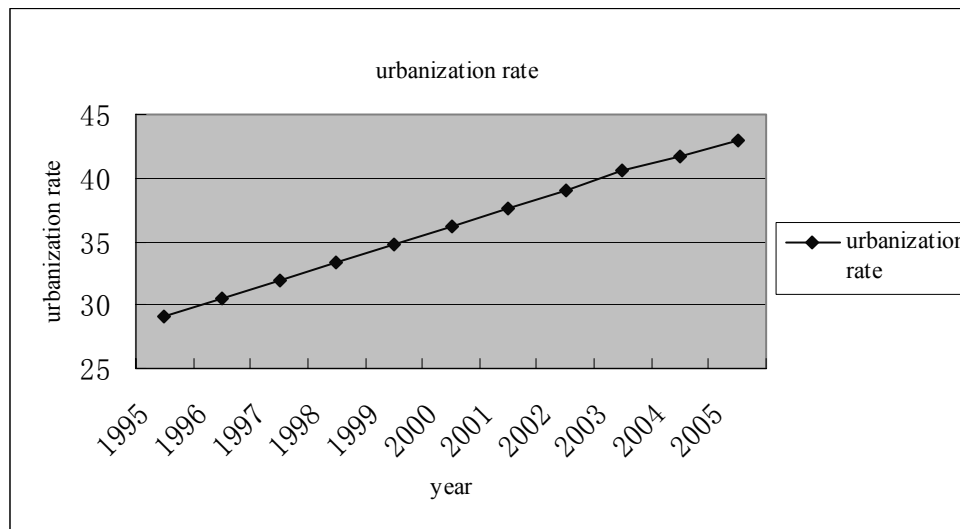


Figure 1. Urbanization rate of China during 1995-2005

# Export Competitiveness of Malaysian Electrical and Electronic (E&E) Product: Comparative Study of China, Indonesia and Thailand

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## Abstract

Malaysia is among the world's top 20 trading nations. This is due to the structural change in the Malaysian economy that turned the country from an exporter of primary commodities into an exporter of high value-added manufactured products. In Malaysia, E&E forged a strong foundation over the last 3 decades, which provides new opportunities for such investments. This study analyzed the structural effect on export competitiveness of Malaysia E&E products focusing on semiconductor (SITC 776), Telecommunication product (SITC 764), Electrical machinery, Apparatus, Part and necessary (SITC 772), Printed Circuit Board (SITC 759) and Disk drives, printers and PCs (SITC 752). Further, the study used the Constant Market Share (CMS) and Revealed Comparative Advantage (RCA) framework to analyze the extent of the export competition between Malaysia and other competitor economies. Overall, CMS result showed that, in the first sub-period (1990-1994), Malaysia E&E export was competitive in the four markets studied, namely the USA, Singapore, Japan and Hong Kong. However, in the second and third period, CMS result showed that Malaysia E&E export increased not due to market competitiveness but due to the structural effect - that is, due to an increase in the world import. In terms of export performance ratio, RCA results showed that, Malaysia E&E products was highly perform only in the US market, for almost all SITC. Indonesia has monopolized the Singapore market and Hong Kong was dominated by China. However, Malaysia E&E export to the world generally has comparative advantage over other competitors namely Indonesia, Thailand and China. The study also revealed that Malaysia has higher export capacity compared to other countries besides the USA, Singapore, Japan and Hong Kong. Therefore, the argument saying that China will intensify the competitiveness of Malaysia E&E market is questionable since the study could not reveal the comparative advantage held by China. The study found that China only dominated in the Hong Kong Market for almost all SITC studied.

**Keywords:** Export Competitiveness, Constant Market Share, Revealed Comparative Advantage

## 1. Introduction

Issue on Malaysia's competitiveness has been widely debated and researched. The crisis that started a few years ago in the Asian NICs (Hong Kong, Singapore, South Korea, Taiwan, Malaysia, Thailand, Philippines, Indonesia), with the implementation of ASEAN Free Trade Area (AFTA) and the open policy of China, have an important impact on the Malaysian economy. The past two decades have seen substantial changing patterns of export share and export merchandise with Malaysia among exporters of primary commodities, labor-intensive goods as well as technology or capital-intensive manufacturers in the world market. As a response to previous studies, this paper assessed Malaysian export competitiveness of Electrical and Electronic (E&E) products vis-a vis the Indonesia, Thailand and China with major exporters (US, Singapore, Japan and Hong Kong) using CMS and RCA indices during a longer time period of 1990 to 2004 (15 years).

This study analyzed the structural effect on export competitiveness of Malaysia E&E products focusing on semiconductor (SITC 776), Telecommunication product (SITC 764), Electrical machinery, Apparatus, Part and Necessary (SITC 772), Printed Circuit Board (SITC 759) and Disk drives, printers and PCs (SITC 752). Further, the study used the Constant Market Share (CMS) and Revealed Comparative Advantage (RCA) frameworks to analyze the extent of the export competition between Malaysia and other world economies. It was argued that the

emergence of other low cost producers such as China and ASEAN Free Trade Area (AFTA) would intensify the competitiveness of the Malaysia E&E market.

Many studies have assessed the competitiveness of Malaysian commodity exports, namely Palm Oil (Fatimah and Roslan, 1988, Mohamad, Fatimah, Abdul Aziz, 1992), Cocoa and rubber (Md Nasir, Mohd Ghazali, Othman, 1993) and all Malaysian manufacturing product (Amir, 2000), using CMS and RCA models. In the current study, the researchers extended the research area by comparing the performance of Malaysia E&E products and their competitiveness with three other countries namely Indonesia, Thailand and China from year 1990 to year 2004. In addition, this study focused on identifying measures and determinants of Malaysian competitiveness in specific E&E sectors using CMS approach and RCA approach.

China's robust economic growth and strong gravitational pull of foreign direct investments were argued to cause serious threats to ASEAN countries, particularly to those which are highly dependent on the E&E sector for their export revenue. Does this then imply doom or gloom for Malaysia? To answer this question, the current study investigated the performance of Malaysia E&E exports and their competitiveness as compared to other competitors. Therefore, the objectives of the study were:

- (1) To analyze the competitiveness of Malaysia E&E exports using constant Market Share (CMS) approach.
- (2) To identify the Malaysian competitive position of E&E exports in the major importing countries between 1990-2004.
- (3) To examine whether the decline in Malaysia E&E export performance over 1990 –2004 was associated with the decline in Malaysian Competitiveness

## 2. Methodology

There are numerous methodologies of research in the field of international trade studies. Among those methodologies, that are to analyze the determinants of manufactured export growth, this research uses a decomposition method called Constant Market Share (CMS) analysis and Revealed Competitive Advantage (RCA) for comparison. The method used was similar to the previous studies of the export competitiveness either primary export commodities-palm oil, rubber, cocoa and pepper or manufactured products such as E&E's, in the global market.

### 2.1 Constant Market Share (CMS)

CMS analysis was used in the present study in order to examine Malaysia's E&E export growth and competitiveness attributable to 'world trade effect', 'commodity composition effect', 'market distribution effect' and 'competitiveness effect'.

'World trade effect' indicated that part of Malaysia E&E export growth was attributed to the general increases of major importers in this study (i.e. USA, Japan, Singapore and Hong Kong). The magnitude of this effect would show the potential increase of Malaysia's exports if they were able to maintain its share as major importers. Commodity composition effect would show whether Malaysia had concentrated on the export of E&E which caused markets to expand rapidly, or on E&E which made markets expanding less rapidly. This effect would reflect the factor endowment of the export country (for instance, Malaysia endowed with technology and labor intensive) and the income and price elasticity of demand for the products in which that country specialized in.

Market distribution effect indicated Malaysia's ability to concentrate on relatively growing countries. The change in exports due to market distribution depended on trade policies and income growth in foreign countries. Competitive effect is defined by the residual term of the CMS model. As residual, it picks up everything not explained by the first three effects. However, this term is taken to indicate the improvement or the deterioration in the competitiveness of exports depending on whether the term has a positive or negative sign. It is usually assumed that this effect is independent of other effects discussed above and it largely reflects the role of domestic factors of the exporting country.

The method basically was built from the assumption that a country's exports may succeed (fail) to grow as rapidly as the world average for three reasons: (1) exports may concentrate in commodities or manufactured product whose demand is growing relatively fast (slowly); (2) exports may have gone to relatively (stagnant) regions; (3) the country in question may have been able (unable) to compete effectively with other sources of supply. Another assumption of the method is that a country's export share in the world market should remain unchanged over time. The differences between the export growth, implied by the constant-share norm, and the actual export growth are assumed to be caused by competitiveness, commodity-composition and market-distribution effect, as mentioned earlier.

### 2.1.1 Conceptual Framework of CMS model

The constant market share model (CMS) is a method that has frequently been used during the last decade to analyze international trade (Chen and Duan, 2000; Ferto, 2004). The idea behind the model is that, given the same level of competitiveness, an industry's market share should remain constant. Therefore, a change in export should be caused by a change of competitiveness. Therefore, to analyze the export performance and competitiveness, CMS model that decomposes the growth of Malaysian E&E exports into two levels of CMS decomposition were used. At the First level, the CMS model decomposes the change in exports into three components:

- (1) The structural effect (*the change in exports due to the change in the selected E&E importing countries*);
- (2) The competitive effect (*the change in exports due to the change in the exporting country's competitiveness*); and
- (3) The second-order-effect (*the change in exports due to the interaction of the change in Malaysia selected E&E product competitiveness and the change in the selected E&E importing countries*).

With the second-level decomposition:

- (4) the structural effect is further decomposed into

- a. the growth effect (*the change in exports due to the change in selected E&E importing countries*)
- b. the market effect (*the change in exports due to the market distribution of an exporting country's E&E exports*),
- c. the commodity effect (*the change in exports due to the commodity composition of an exporting country's E&E exports*), and
- d. the interaction effect (*the change in exports due to the interaction of the market distribution effect and the commodity composition effect*);

- (5) The competitive effect is split into:

- a. General competitive effect (*the change in exports due to the change of an exporting country's competitiveness in its total E&E exports to the selected E&E importing countries*), and
- b. Specific competitive effect (*the change in exports due to the change of an exporting country's competitiveness in its exports of specific commodities to specific world markets*).

- (6) Second order effect is divided into

- a. Pure second-order effect (*the change in exports due to the interaction of an exporting country's export competitiveness and the selected E&E importing countries*).
- b. The dynamic structural effect (*the change in exports due to the interaction of an exporting country's export competitiveness and imports of specific commodities in specific world markets*).

### 2.1.2 The CMS formula:

The first level:

$$\Delta \bar{E} = \sum_i \sum_j S^o_{ij} \Delta Q_{ij} + \sum_i \sum_j Q^o_{ij} \Delta S_{ij} + \sum_i \sum_j \Delta S_{ij} Q^o_{ij}$$

(Structural effect)      (competitive effect)      (Second-order effect)

The formula can be further decomposed into the following components:

$$\begin{aligned} \Delta \bar{E} = & \underbrace{S^o \Delta Q}_{\text{growth effect}} + \underbrace{(\sum_i \sum_j S^o_{ij} \Delta Q_{ij} - \sum_i S^o_i \Delta Q_i)}_{\text{Market effect}} + \underbrace{(\sum_i \sum_j S^o_{ij} \Delta Q_{ij} - \sum_j S^o_j \Delta Q_j)}_{\text{commodity effect}} \\ & + [(\sum_i S^o_i \Delta Q_i - S^o \Delta Q) - (\sum_i \sum_j S^o_{ij} \Delta Q_{ij} - \sum_j S^o_j \Delta Q_j)] + \Delta S Q^o \\ & \quad \text{structural interaction effect} \quad \text{General competitive effect} \\ & + (\sum_i \sum_j \Delta S_{ij} Q^o_{ij} - \Delta S Q^o) + (Q^I / Q^o - 1) \sum_i \sum_j \Delta S_{ij} Q^o_{ij} \\ & \quad \text{specific competitive effect} \quad \text{Pure Second-order effect} \\ & + (\sum_i \sum_j \Delta S_{ij} \Delta Q_{ij} - (Q^I / Q^o - 1) \sum_i \sum_j \Delta S_{ij} Q^o_{ij}) \end{aligned}$$

Dynamic structural residual

Whereby;

$\bar{E}$  = is Malaysia export value/volume of commodity  $i$  to destination  $j$

$S$  = is Malaysia's share of the world export of E&E product world market;

$S_j$  = is Malaysia's share of the world export of E&E product in destination  $j$

$S_i$  = is Malaysia's share of the world export of commodity  $i$

$S_{ij}$  = is Malaysia's share of the world export of commodity  $i$  in destination  $j$

$Q$  = is an total world export of E&E products

$Q_j$  = is total world export of E&E product to destination  $j$

$Q_i$  = is the total world export of commodity  $i$

$Q_{ij}$  = is total export of commodity  $i$  in destination  $j$

$\Delta$  = represent the change in the two periods; superscript 0 is the initial year, 1 is the terminal year.

Superscript  $i$  = represent export commodities (here, semiconductor); and  $j$  represents export destination (here, US, Singapore, Japan, Hong Kong and Netherlands).

## 2.2 The RCA Model

Revealed Comparative Advantage (RCA) can measure changes in comparative advantage. In theory, it provides an index measure of changes in comparative advantage. Balassa's (1979, 1986) came out with the RCA index that compares the export of a given sector in a country with the export share of that sector in the world market. Competitiveness measured by RCA will denote as one or greater the "underlying competitiveness", measured by comparative advantage. Consequently, if a product is described as competitive, it means that it has a revealed comparative advantage.

The Revealed Comparative Advantage ( $RCA_{ij}$ ) expresses the share of country  $i$ 's export of product  $j$  in the total world export of product  $j$ , as a ratio of the share of country  $i$ 's total export of the world. In other words, the Revealed Comparative Advantage ( $RCA_{ij}$ ) measures the share of countries ( Malaysia, Thailand, Indonesia, China ) export of SITC 776, 772, 764, 759, 752 in the total world export. SITC 776, 772, 764, 759, 752, was a ratio of the share of country's export of E&E in the total world export of E&E product. The Revealed Comparative Advantage for four countries was collected from year 1990-2004. The Revealed Comparative Advantage of one indicates that, the export performance of SITC 776, 772, 764, 759, 752 relative to the size of the specific country as an exporter of E&E is normal . If it is *less than one* means that of low performance and abnormal.

$$RCA = (C_{ij} / Q_{ij}) \quad (C_i / Q_i)$$

Whereby:

$C_{ij}$  = Country export of commodity  $i$  to destination  $j$

$Q_{ij}$  = World export of commodity  $i$  to destination  $j$

$C_i$  = Country export of commodity  $i$  to the world

$Q_i$  = Total World export of commodity  $i$

## 3. Data Collection

International trade consists of trade in goods and trade in services. Basically, the transaction of physical goods is defined as trade in goods, while the measurement of trade in services is inherently more difficult than that of trade in goods. This research anyway focused only on trade in goods; therefore the word 'trade' in this research means trade in goods.

Among various trade classifications, it utilized Standard International Trade Classification (SITC) for data analysis. The SITC has a 5 level hierarchical structure. Level 1, that is SITC digit 1, consists of 9 sections. Section 0 to 4 can be defined as the non-manufacturing sector, while sections 5 to 8 are defined as the manufacturing sectors. Section 9 consists of products that cannot be classified into section 0 – 8. Most discussion in this research focuses on export products categorized in SITC 7 that is under E&E products.

SITC 7 of Malaysia, China, Thailand and Indonesia were considered for the analysis. The three countries (China, Thailand and Indonesia) were used as a comparative measure for Malaysia's E&E competitive advantage due to the acknowledgment from many studies (e.g. Wawan and Puji, 2003; Keannil 2004) that these three countries are competing with one another as a major exporter of E&E product to major market such as the US, Japan, Singapore, Hong Kong, etc.

The period chosen for this examination was 1990 to 2004 (15 years) which were divided into three sub periods (i.e. five years per period). This period saw substantial growth of trade in these markets. The data were obtained from Central Bank of Malaysia (BNM) world report, Comtrade U.N., and MATRADE export performance of E&E in Malaysia. The current (2003) BNM report contains 15 years (1990 –2004) of annual export and import values organized by country and by commodity. The BNM report based on Standard International Trade Classification

(SITC) provided the data at the total and 1-9 digit SITC levels. CMS estimated the growth in E&E exports in each of three sub-periods; 1990-94, 1995-99, 2000-2004. These sub-periods were chosen on the belief they were most homogeneous with the changes in exchange rate regimes and business cycle activity over 1990-2004. The market share was calculated at the 7-digit level of the SITC nomenclature.

To aid in the interpretation of empirical result later, five Malaysia E&E products were chosen, namely Telecommunication equipment (SITC 764); Disk drives, printers and PCs (SITC 752), Electrical machinery, Electrical machinery, Apparatus, Part and Necessary (SITC 772), semiconductor (SITC 776); Printed Circuit Board (SITC 759)). Based on Malaysia's export in E&E products, individual countries were grouped into four destination markets (United States, Singapore, Japan and Hong Kong.). The main competitors identified for Malaysia in the world market were China, Thailand and Indonesia.

#### 4. Result and Findings

##### 4.1 Constant Market share

This section presents the empirical result of the Constant Market Share (CMS) procedures used in the study. The main objective of this research is to analyze the export competitiveness of Malaysian electrical and electronics industry. Under CMS technique, the three structural components of the market shares model were calculated under the assumption that base period export shares were maintained in other market periods. For the purpose of this study, Malaysia's electrical and electronics export in Period II (1995-1999) was analyzed in comparison to Period I (1990-1994). Next, Malaysia's electrical and electronics export Period III (2000-2004) was analyzed in comparison to Period II. Finally Malaysia's electrical and electronics exports during Period I and III were analyzed. The three periods represent five years average. A five years average is chosen in order to avoid year to year fluctuations.

The CMS technique decomposes the change in export value into eight components; growth effect, market effect, commodity effect, interaction effect, general competitive effect, Specific competitive effect and pure second order effect, dynamic effect. The study selected four importing countries namely USA, Singapore, Japan, Hong Kong. They are the most significant importers of Malaysia's electrical and electronics industry.

The average result of yearly decomposition of the change in Malaysia's export value of Electrical and Electronics (E&E) selected products for the period 1990-1994, 1995-1999 and 2000-2004 are provided in Table 1. Table 1 shows the decomposition of Malaysia Electrical and Electronics export gain or loss between periods. This table presents the relative contribution of each effect on the change in the E&E exports between the three sub-periods.

##### 4.1.1 Change in Export Value

Change in Export value was defined as an increased or a decreased in export in conjunctions to the contribution of structural effect, competitive effect and second order effect.

##### 4.1.2 Structural Effect

Structural effect encompasses of growth effect, market effect, commodity effect and interaction effect. Growth effect measures the change in export for Malaysia's E & E products due to the change in the total world import of E & E products. It means any increment in the total world import of E & E products will cause the total export of Malaysia's E & E products increase too. Over the period 1990-1994 the growth effect accounted for 62.02 %, that is the highest growth effect among the three sub period studied. But it dropped to 0.29% in 1995-1999 (*may be due to Asian Financial Crisis*) and improved to 38.26% in the sub period between year 2000-2004. In other words, the increase in Malaysia's export of E & E products in period one and two mainly attributed by the general increase in the total world import of E & E products.

Table 1. Result of yearly decomposition of change in Malaysia's export value of E&E products

(US\$)						
Periods	1990 - 1994		1995 - 1999		2000 - 2004	
	Value	%	Value	%	Value	%
<b>Change in Export Value</b>	109,238,792,420.94	100%	16,264,746,520,774.50	100%	\$26,428,872,820,103.70	100%

<b>Structural Effect</b>	-\$45,609,401,124.59	-41.75%	\$16,370,536,425,856.30	100.65%	\$20,913,297,807,582.50	79.13%
Growth Effect	\$67,752,384,708.73	62.02%	\$46,425,640,522.99	0.29%	\$10,111,816,238,234.70	38.26%
Market Effect	-\$65,972,641,857.35	-60.39%	-\$48,860,790,706.00	-0.30%	\$245,377,632,674.43	0.93%
Commodity Effect	-\$209,315,753,006.91	-191.61%	-\$30,475,420,918.56	-0.19%	-\$161,313,506,161.37	-0.61%
Structural Interaction Effect	\$161,926,609,030.94	148.23%	\$16,403,446,996,957.90	100.85%	\$10,717,417,442,834.70	40.55%

<b>Competitive Residual</b>	\$113,672,297,073.41	104.06%	-\$74,505,795,473.88	-0.46%	\$5,468,290,330,181.15	20.69%
General Competitive Effect	\$40,807,364,902.08	37.36%	\$22,453,164,985.70	0.14%	\$5,441,645,405,195.83	20.59%
Specific Competitive Effect	\$72,864,932,171.33	66.70%	-\$96,958,960,459.57	-0.60%	\$26,644,924,985.32	0.10%

<b>Second Order Effect</b>	\$41,175,896,472.12	37.69%	-\$31,284,109,607.96	-0.19%	\$47,284,682,340.05	0.18%
Pure Second Order Effect	\$47,352,396,534.28	43.35%	-\$18,807,865,340.30	-0.12%	\$25,842,973,572.69	0.10%
Dynamic Structural Residual	-\$6,176,500,062.15	-5.65%	-\$12,476,244,267.67	-0.08%	\$21,441,708,767.36	0.08%

Market effect is referring to the change in export due to the market distribution of an exporting country's of E & E products. It shows either Malaysia exporting their E & E products to the market or destination which experience high import growth of our products. In 1990-1994, the market effect registered -60.39% which means that Malaysia exporting their E & E products to the countries which experience low import growth market (U.S.A., Singapore, Japan, Hong Kong). But it was slightly improved to -0.30% in year 1995-1999 and 0.93% in 2000-2004.

The commodity effect shows the change in exports due to the commodity composition of exporting country's of E & E products. It measures either Malaysia exporting their E&E products ( SITC 776, SITC 772, SITC 764, SITC 759, SITC 752) which experience high import demand in the importing countries ( U.S.A., Singapore, Japan, Hong Kong ). Over the period 1990-1994, the commodity effect accounted for -191.61%. It shows that Malaysia exporting their E & E products to the very low demand importing countries. Even though a big improved has occurred in 1995-1999 and 2000-2004 to -0.19% and -0.61% respectively, but it still recorded the negative values for the three sub periods.

The interaction effect indicates whether the country is specialized in those sectors in which it also enjoys a competitive advantage. Therefore, the interaction effects will be positive in values if the country specialized on export where it has or enjoy a competitive advantage or produces little of the export in which it has no such advantage (disadvantage). In 1990-1994, the interaction effect account for 148.23 %, which is the highest recorded throughout the period studied. However it's dropped to 100.85 % in year 1995-1999 period and register 40.55 % in the third period between 2000-2004. It indicates that Malaysia specialized in those products which have a competitive advantage.

#### 4.1.3 Competitive Residual

Competitive residual encompasses of specific and general competitive effect. The competitive effect measures the change in export due to the change in the exporting country's competitiveness. Positive sign of competitive effect and interaction effect indicate that Malaysia has strengthen their competitiveness and changing export composition are almost equally important in explaining the increase in Malaysia's export of E & E product over the period of 1990-1994 and 2000-2004.

Over the period 1990-1994, the competitive residual accounts for 104% of the increment in Malaysia's export value and the general competitive effect account for 37.36%. A positive general competitive effect signals that the general increase in competitiveness contributes positively to the increase in Malaysia export value of E & E products.

The specific competitive effect registered 66.70% over this period. A positive specific competitive effect indicates that the change in Malaysia's export structure show a favorable interaction with the pattern of international demand. In the net term, the increase in general competitive effect and specific competitive effect resulting in an increase in overall competitive residual in the period 1990-1994. In other word increasing in general and specific competitive effects indicate the rising competitiveness and increase in market share of the exporting market (U.S.A., Singapore, Japan, Hong Kong) are almost equally important in explaining the increase in Malaysia export value of E & E products over 1990-1994 period. However, in 1995-1999, the competitive residual dropped tremendously to -0.46%. It indicates that Malaysia's competitiveness of E & E products in the second period appeared to deteriorate rapidly compared to that in the first period. However, in year 2000 to 2004 it is slightly improved to 21%. In this period general competitive effect accounted for 20.59% whereas specific competitive effect registered 0.10% only.

#### 4.1.4 Second Order Effect

The second order effect measures the change in export due to the interaction of the change in an exporting country's competitiveness and the change in the total world import of E & E products. In 1990-1994, the second order effect recorded 37.69% to the change in export value of Malaysia's E & E products. Pure second order effect contributes 43.35% but Dynamic structural effect recorded -5.65% for the period 1990-1994. Dynamic structural effect measure the change in exports due to the interaction of an exporting country's export competitiveness and import of specific commodities in specific world market.

The second order effect accounted a shape decline to -0.19% in period of 1995-1999 followed by 0.18% in year 2000-2004. In the second period Second order effect and Dynamic structural effect contributed only -0.12% and -0.08% and in the third period recorded 0.10% and 0.08%. Both periods indicate insignificant contribution of the second order effect to the change in Malaysia's export of E & E products but change in export value contributed by interaction effect which accounted for 100.85%. However other effects almost recorded negative sign and if positive, the value is less than 1%. In the third period of 2000-2004, the increase in Malaysia's export of E & E products is mainly attributed to the general increase in the total world import of E & E products and interaction effect. A positive sign of competitive residual and interaction effect indicates that Malaysia has strengthen their competitiveness and changing export composition are almost equally important in explaining the increase in Malaysia's export of E & E products over this period.

Over the period of 1990-1994, Malaysia E&E exports showed their competitiveness. This is due to the fact that the competitive residual have showed 104% of change in Malaysia's export value which comprised the general competitive effect account of 37.36% and specific competitive effect account of 66.70%. A positive general competitive effect signals that the general increase in competitiveness contributed positively to the increase in Malaysia's export value of E & E selected products. A positive specific competitive effect on the other hand indicated that the change in Malaysia's export structure showed favorable interaction with the pattern of international demand. In the net term, the increase in general competitive effect and specific competitive effect resulted in an increase in overall competitive residual between the period of 1990-1994. In other words, increase in general and specific competitive effects indicated a rise in competitiveness of Malaysia E&E selected products in the market of the importing countries (U.S.A., Singapore, Japan, Hong Kong). This is almost equally important to explain the increase in Malaysia's export value of E & E products over the 1990-1994 period. In addition, the first sub-period, also showed that there was a positive 37.69% of second order effect. This shows that Malaysia E&E products experienced an increase in competitiveness and at the same time, the total import of the importing countries (US, Singapore, Japan, Hong Kong) also increased.

In summary, for the second sub-period (1995-1999), structural effect dominated other effects in explaining change in export value as the CMS result showed a positive 100.65% of the effect. This result was contributed by structural interaction effects which was 100.85%. It shows that Malaysia had specialized and exported E&E products which had competitive advantage (i.e. SITC 776,759). For the third sub-period (2000-2004), the result shows a slight improvement for all effects calculated. It shows a positive value of 79.13% for structural effect, 20.69% for competitive residual and 0.18% for second order effect. Therefore the change in export value was contributed only partly by competitive residual and mainly by structural effect – that is, from the specialization of highly value added products (SITC 776, 759) and highly demanded products (US and Singapore market).

#### 4.2 Revealed Comparative Advantage (RCA)

For comparison, the current study used RCA model to measure export performance of Malaysia E&E selected product. RCA value of more than 1 indicate that, the E&E product produced by one country has comparative



advantage. The result shows that Malaysia E&E export to the world generally has comparative advantage over other competitors namely Indonesia, Thailand and China. However, Malaysia E&E export performance ratio to the studied destination was fluctuate over the years of the study. Table 2a-2e below is the summarization of the RCA results.

Table 2a. Summarization of RCA results for SITC 776

Export Destination	SITC 776 – semiconductor											
	Sub-period 1 (1990-1994)				Sub-period 2 (1995-1999)				Sub-period 3 (2000-2004)			
	USA	Singapore	Japan	HKong	USA	Singapore	Japan	HKong	USA	Singapore	Japan	HKong
Malaysia	1.67	2.54	0.43	1.11	<b>2.54</b>	3.88	0.70	2.44	0.82	2.09	0.47	1.80
China	0.23	0.06	0.34	<b>7.72</b>	0.73	1.01	1.22	<b>17.43</b>	0.49	0.79	0.77	<b>4.69</b>
Thailand	1.44	<b>3.66</b>	0.39	0.49	1.82	3.90	<b>1.49</b>	2.33	0.50	0.43	0.81	0.96
Indonesia	<b>1.79</b>	3.50	0.19	0.66	1.80	<b>7.51</b>	1.00	1.91	0.24	<b>2.08</b>	<b>1.22</b>	1.14

Table 2a above summarizes the Export Performance Ratio of SITC 776 or semiconductor product. Malaysia E&E product has comparative advantage for almost all export destinations except for Japan. However, for all three sub period, Malaysia only dominated USA import of E&E for the second sub period.

China on the other hand has comparative advantage only in Hong Kong. For Thailand, good performance shows in the second sub period. For the first sub period, their E&E product shows positive comparative advantage only in Singapore but in the third sub period no comparative advantage have shown as the RCA value shown was less than 1. Indonesia also shows good performance in the second and third sub period accept for USA but in the first sub period, Indonesia dominated the USA market.

Table 2b. Summarization of RCA results for SITC 752

Export Destination	SITC 752 - Disk drives, printers and PCs											
	Sub-period 1 (1990-1994)				Sub-period 2 (1995-1999)				Sub-period 3 (2000-2004)			
	US A	Singap ore	Japan	HKon g	US A	Singapo re	Japa n	HKon g	US A	Singap ore	Japa n	HKon g
Malaysia	<b>2.37</b>	1.15	0.11	0.28	2.2 7	0.62	0.84	1.32	<b>4.2</b> 7	0.63	1.02	0.56
China	1.42	0.30	0.66	<b>19.90</b>	<b>2.5</b> 3	0.91	<b>1.40</b>	<b>14.47</b>	2.3 2	0.27	<b>1.70</b>	<b>6.30</b>
Thailand	1.64	1.86	0.16	0.97	1.9 8	1.81	0.95	0.59	1.5 0	0.34	1.12	0.46
Indonesia	0.66	<b>3.44</b>	0.07	0.48	1.5 0	<b>2.17</b>	0.37	1.20	1.4 0	<b>2.33</b>	1.05	2.40

Table 2c. Summarization of RCA results for SITC 759

Export Destination	SITC 759 - Printed Circuit Board											
	Sub-period 1 (1990-1994)				Sub-period 2 (1995-1999)				Sub-period 3 (2000-2004)			
	US A	Singap ore	Japan	HKon g	US A	Singapo re	Japa n	HKon g	US A	Singap ore	Japa n	HKon g
Malaysia	<b>1.04</b>	7.03	0.30	0.28	<b>1.2</b> 3	2.80	0.42	0.55	<b>1.5</b> 5	2.88	0.68	0.40
China	0.52	0.11	0.18	<b>3.33</b>	1.0 8	0.92	0.73	<b>2.69</b>	1.0 8	0.65	0.64	<b>3.31</b>
Thailand	1.00	6.58	0.55	0.18	0.8 7	2.77	0.57	0.33	0.4 7	2.37	0.43	0.27
Indonesia	0.36	<b>8.73</b>	0.01	0.13	0.0 5	<b>4.88</b>	<b>1.71</b>	0.13	0.0 8	<b>7.91</b>	<b>1.29</b>	0.04

Export performance ratio of SITC 752 ( disk drivers, printers, PCs ) shows that most competitors recorded positive ratio. Malaysia however, only competitive in the USA market and dominate the market for the first and third sub period. China again still dominate the Hong Kong market and extend their market to Japan with the highest ratio for both sub period two and three. Thailand has recorded no domination but Indonesia has dominated Singapore market for all three sub period.

Export performance ratio of SITC 759 (printed circuit board ) recorded less than one for almost all competitors observed. Malaysia shows competitiveness for almost all market accepts Japan, and Hong Kong. For all the sub period, Malaysia dominated the USA market and China still dominated the Hong Kong market although no competitive advantage shown on other countries. Thailand showed positive export performance ratio only in the US and Singapore market and Indonesia dominate Singapore market for all three sub period and Japan in the second and third sub period.

Table 2d. Summarization of RCA results for SITC 764

Export Destinati on	SITC 764 - Telecommunication product											
	Sub-period 1 (1990-1994)				Sub-period 2 (1995-1999)				Sub-period 3 (2000-2004)			
	US A	Singap ore	Japan	HKon g	US A	Singapo re	Japa n	HKon g	US A	Singap ore	Japa n	HKo ng
Malaysia	2.49	<b>11.47</b>	0.32	0.47	<b>1.7</b>	6.06	1.17	0.78	<b>3.5</b>	5.29	1.20	0.68
China	0.74	0.29	0.57	<b>8.16</b>	1.2	0.90	<b>1.95</b>	<b>4.34</b>	1.9	1.23	2.11	<b>3.50</b>
Thailand	<b>3.00</b>	3.86	0.81	0.29	1.7	2.86	1.53	0.48	1.3	2.26	<b>2.24</b>	0.26
Indonesia	2.00	9.58	0.54	0.16	1.3	<b>10.70</b>	0.79	0.37	2.8	<b>11.72</b>	1.45	0.36

Export performance ratio of SITC 764 ( telecommunication equipment) shows that Malaysia dominated US market for the second and third sub period and dominated Singapore market in the first sub period. China again dominated all Hong Kong market and Japan market for second sub period. For SITC 764, it shows that China has improved their export performance as in the third sub period; they have show competitive advantage for all export destination. Indonesia still dominated Singapore market and Thailand dominated the US market for the first sub period.

Table 2e: Summarization of RCA results for SITC 752

Export Destinati on	SITC 772 - Electrical machinery, Apparatus, Part and Necessary											
	Sub-period 1 (1990-1994)				Sub-period 2 (1995-1999)				Sub-period 3 (2000-2004)			
	US A	Singap ore	Japan	HKon g	US A	Singapo re	Japa n	HKon g	US A	Singap ore	Japa n	HKo ng
Malaysia	0.96	2.58	0.11	0.07	1.6	1.50	<b>2.59</b>	0.10	<b>2.0</b>	0.72	0.03	0.05
China	0.44	0.60	0.41	<b>10.93</b>	0.8	1.07	1.09	<b>10.62</b>	0.9	1.90	0.96	<b>8.36</b>
Thailand	<b>1.54</b>	1.01	0.18	0.08	<b>1.7</b>	0.95	0.11	0.17	0.9	0.39	0.12	0.11
Indonesia	0.47	<b>17.71</b>	<b>1.33</b>	0.43	0.5	<b>9.56</b>	0.70	3.88	0.6	<b>15.91</b>	0.99	1.00

Export performance ratio of SITC 772 ( electrical machinery, apparatus, parts and necessary ) in U.S.A. market for four countries observed show that most competitors recorded less than one RCA value. Thailand however, has dominated the US market for both first and second sub period. Indonesia however still dominated the Singapore market for all sub period. Malaysia have shown poor performance for the third sub period accept for US market as all RCA value for all the destination was less than 1. China still dominated Hong Kong market at a huge value for all sub period.

Overall RCA results shows that Malaysia E&E export to the world generally have comparative advantage over other competitors namely Indonesia, Thailand and China. The study also revealed that Malaysia has higher export capacity to other countries besides the USA, Singapore, Japan and Hong Kong. However, Malaysia E&E export performance ratio to the studied destination fluctuated over the years of the study. Malaysia export performance was competitive for the US and Singapore market. However, Malaysia E&E export performance ratio was dominant in the US market for SITC 776 for the second and third sub-period. Similar situation occurred for SITC 772. For the first sub-period, export performance ratio of SITC 776 to US was dominated by Indonesia and SITC 772 was dominated by Thailand. In Singapore market, Malaysia only dominated the E&E products of SITC 776 in the third sub-period, previously dominated by Thailand and Indonesia respectively. For Japan market, Malaysia export performance ratio was poor and it was mainly dominated by Indonesia. On the other hand, Malaysia export performance ratio for SITC 772 was also poor in Singapore, Japan and Hong Kong as it was mainly dominated by Indonesia and China. For SITC 764 and 759 most market was monopolized by Indonesia and China.

Malaysia only dominated the US market in the second and third sub-period for SITC 764, and in all other sub-periods for SITC 759. For SITC 752, Malaysia export performance ratio was good in the first and third sub-periods but in other markets it was mainly controlled by other competitors. Overall, it was found that for all sub-periods, Hong Kong market was one hundred percent monopolized by China.

## 5. Conclusion

It can be concluded that based on the results from CMS analysis, the total change in export value was mainly contributed by Competitive residual for period I (1990 -1994) while for period II (1995-1999) and III (2000-2004) were contributed by structural effect.

It indicates that in period I, Malaysia E&E export value increased due to the increase in competitiveness of the E&E products. On the other hand, increase in export value for Malaysia E&E products in period II was not related to competitive residual but by structural effect, that is, it was due to an increase in the world demand for specific E&E products. Furthermore, in period III, an increased in Malaysia E&E export value was mainly contributed by structural effect and partly by competitive residual.

In terms of export performance ratio, RCA results show that, in almost all SITC, products of Malaysia E&E highly performed in the US market. Indonesia was controlled the Singapore market while Hong Kong was monopolized by China.

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# The Cultivation of Farmers' Social Capital from the Perspective of the New Rural Construction

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## Abstract

This paper firstly analyzes the two aspects and the two kinds of capitals in new rural construction and then puts forwards the deficiency of countryside in social capital aspect. Theoretically, this paper questions the popular way of founding special cooperative organization in countryside and analyzes the problems in its practical operation. In authors' opinion, the only way to construct the rural productive social capital and the distributive social capital reasonably is to found the agricultural cooperatives based on references from outer experiences and inner reform. It is urgent to make innovations on present rural management system in order to realize the socialism new rural construction.

**Keywords:** Natural capital, Social capital, Foundation of agricultural cooperatives

## 1. Introduction

In 2006, the No.1 document of central government puts forward the general program for new rural construction. This document makes it clear to construct a new countryside with developed production, well-to-do living, polite ethos, clean environment, and democratic administration. At the same time, it advances guidelines and implement ways as creeds in constructing new countryside. During the two years of new rural construction, it begins everywhere. Besides derating agricultural taxes, some place emphasizes on construction of country roads and communication facilities, some builds or repairs houses for farmers, some reduces tuitions for children from families in poverty or distress, some applies new-type rural cooperative medical care, and some provides with direct compensation for food production counties. Plus former self-administrative construction for the wide election of rural residents committee, the central government pays countless attentions for the rural, agricultural, and farmer problems. However, what problems and to what degree for the rural, agricultural, and farmer issues have been solved? Or, if we want to realize the goal of new countryside proposed in the No.1 document, what do we need to do?

## 2. The new rural construction's two aspects and two kinds of capitals

We can analyze the construction of new rural area from two aspects. In one aspect, transfer wealth to farmers directly (similar to a fable, the old goat sends the cabbage to the chick). In the other aspect, enrich the natural capital and construct powerful social capital for the rural area or the farmers (similar to a fable, the old goat sends the cabbage seeds to the rabbit). The natural capital directly associates with agricultural productivity and how much wealth farmers can gain from agricultural production. The social capital concerns farmers' position in the re-distribution of social wealth and the production potential of rural area and farmers (the former social capital is named as the distributive social capital, and the later the productive social capital). The short-term direct wealth transfer for farmers can be realized by government's self-discipline and effective policies. For the long run, it is impossible (unless there is only good government). Therefore, it has to depend on the improvement of farmers' negotiation strengths in the re-distribution of social wealth. In other words, cultivate rural area and farmers' powerful social capital. Only when rural area and farmers' natural capital and social capital have been improved significantly, can their productivity and income achieve sustainable increase. As the two step into a favorable circulation, a new countryside with "developed production, well-to-do living, polite ethos, clean environment, and democratic management" differing from present rural situation will come into being in the future.

The measures performed by the government at present can be classified into two aspects, namely enriching (constructing) rural and farmer capitals and transferring social wealth directly. In a sense, all measures implemented at present have the nature of direct transfer of social wealth. Besides, derating agricultural taxes, executing rural residents' self-governance and new-type rural cooperative medical care, reducing tuitions for children from families in poverty and distress, and providing with direct compensation for grain farmers can increase the social capital of

countryside. Constructing and repairing country roads and communication facilities can help to increase the natural capital of countryside.

Because projects can increase the natural capital, under present system all governments at different levels tend to start projects. If there are enough money, it is not necessary to worry about who can construct the transportation and communication facilities for the countryside. But whether the capitals for infrastructure construction can be used effectively or not should be aroused attentions. Of course, for present infrastructure construction in rural area, the basic water conservancy facilities for defending flood and dry is extremely weak. Years of flood and dry in China completely illustrates this point. But that is not the point in this paper.

For new rural construction, the fundamental issue is to construct or cultivate rural social capital. If the rural area and farmers do not possess powerful social capital, the transfer of social wealth to rural areas and farmers is not sustainable and the natural capital of rural area and farmers can not be enriched completely. And the most difficult issue is also the construction or cultivation of rural area and farmers' social capital. Because the improvement of rural social capital usually means the reduction of strong groups' power, it will face up with great resistance. If the government is not far-sighted or does not possess sufficient public power, it can not effectively adjust the social capital pattern and improve the rural area and farmers' social capital. Then, how could we construct the rural social capital in order to realize the "new rural area" programmed in the No.1 document by the central government in 2006? That is the point in this paper.

### **3. The deficiency of present new rural construction in the aspect of constructing rural social capital**

Among all those measures for constructing rural social capital performed by the government, only the rural residents' self-governance and the remission of agricultural taxes are established in law. Although the nine-year compulsory education is established by law, it can not be fully applied. Besides, though the central government regulates that since 2006 all students in the nine-year education period are free from tuitions in western China, it can not be carried out in certain regions and provinces (only students from families in poverty or distress are free from tuitions). Not mention the soft restrains, such as the grain direct compensation policy (firstly, it does not have a clear time schedule for the compensation; secondly, it is not written in laws; thirdly, the compensation is not meaningful for realizing the goal of new rural construction). As far as whether the new-type rural cooperative medical care can achieve sustainable effect or not, we will wait and see what happens. Here we will not discuss this issue.

Then, why do these institutional policies that do not benefit the rural area, farmers, and agriculture appear? The reasons deserve further exploration. Otherwise, the new rural area will be always a fancy picture. The main reason, in authors' opinion, is the deficiency of social capitals possessed by farmers whose position in social wealth's re-distribution is extremely low, whose interests can not be guaranteed effectively (such as the right of nine-year compulsory education, the right of holding lands), not mention to affect the government policies and drive the government to constitute policies that benefit the "three rural, farmer, and agricultural issues". At present, all policies that benefit the "three rural, farmer, and agricultural issues" implemented by the government are from the government's self-discipline and far-sighted ideas instead of farmers' social capital. However, if the economic growth and the social prosperity depend on the government's self-discipline and far-sighted ideas, it can not be sustainable. The prosperity and the decline of all dynasties appeared in China history well illustrate this point. Under the present pattern of social capitals with large distances, it is hard for the new rural construction that aims at improving China's grain productivity, farmers' living level, and rural environment, to achieve fundamental progresses. Even there is certain progress, it can not be sustainable. Then, how could we construct the social capital for rural area?

### **4. How to construct the social capital for new rural area.**

#### *4.1 Rural special cooperative organization*

At present, the agricultural special cooperative organization appears everywhere. In practice, there is successful instance, such as some special cooperative organizations in Leshan, Sichuan province. Undeniably, this special cooperative organization can realize the small-sized cooperatives to certain degree. Its initial aim is to dig out the production potential of agriculture, and depend on market and enterprises to reduce the separation of farmers' decision, and finally develop into modern agriculture. However, the cooperatives are still a construction process of productive capital at a low level. And this productive capital is not for distribution.

On one hand, it is questionable to enrich the rural productive social capital by constructing special cooperative organization. The enrichment of productive social capital includes rich contents. One of the main aspects is the complete development of agricultural production potential. For example, the modern agricultural machines, the cultivated seeds, the environment-friendly pesticides, the special business management techniques, and the consulting services for the sustainable development of agriculture, all these belong to the construction of productive

social capital.

We should notice that the government invests more in the development of rural area, driving the economic development by lots of ways. Besides, the government sets up different kinds of agricultural special cooperative organizations. However, because people's understanding toward the productive social capital is not complete at present and the scope of special cooperative organization is not clear, the development of special cooperative organization is short of development drives and confronts with problems, such as "comparative advantage traps". No technologies and standards for products. No consciousness of brand. Special agricultural products do not have strong core competence. All these facts restrain the complete development of agricultural potential. Moreover, it is impossible to construct distributive and productive capital merely by special cooperation. Under the background of government size and function's adjustment and transfer, the development of agriculture should dig out the inner motive from other channels. To develop the agricultural cooperatives is an effective form to dig out the inner motive. In other words, the core is how to construct the productive capital that possesses distributive nature.

On the other hand, the special rural cooperative organization does not aim at enriching the social capital that can enhance the effects on negotiation, which makes it short of an inner development mechanism for sustainable development. Even few special rural cooperative organizations win successes it is chance that makes it. Therefore, in practice it is inevitable to come across this or that problem. In specific, China farmers have not a powerful organization that represents their interests. With the precondition of no guarantee for the construction of farmers' social capital, the development of special rural cooperative organization faces up with many serious problems, such as the absence of property right, and the imperfection of contract. Although farmers are organized together by special cooperative organization, they are still independent and separate decision subjects. Plus the restraints of rural objective natural conditions and the scarcity of arable land per capita, no matter what it is the enterprise dominated "enterprises plus farmers" mode or the government dominated "agricultural schools plus farmers" mode, farmers do not form a powerful integration. Comparing with the enterprises and the governments, they are still in an inferior position. They can not have words in negotiation. As a result, farmers' interests can not be guaranteed and even be hurt because of information asymmetry. So, problems, such as the high contract-disobey ratio in the rural cooperative organization, and the absence of guarantee for member farmers' partial property right mentioned above are rooted in this issue.

Enrich farmers' natural capital and enhance their social capital by constructing special cooperative organization. Authors name it as an "indirect path". In essence, it is a kind of institutional arrangement for solving facial problem but not the fundamental one. The special rural cooperative organization can develop into agricultural cooperatives (if possible). But the explicit costs deserve further calculation and the implicit costs are even immeasurable.

#### *4.2 The foundation of agricultural cooperatives and the enrichment of farmers' social capital*

Some people think that agricultural cooperatives will harm the social stability. That is not the truth. The substitution of every feudalism dynasty in China history concerns with farmers' insurgence. Because farmers belong to one social group, if their interests can not be realized by a peaceful way, namely the politics, and the social conflict can not be solved in time and finally accumulated to certain degree, the farmers have to pursue their interests by war. However, as individuals, farmers, no matter whenever it was past feudal dynasty or present socialism time, are rational men. They will never sacrifice their lives for mini interests. Only when expected returns surpass costs, can they start a war, in which they may lose their lives. Therefore, only when farmers' lives face up with risks, can they participate in a war. At present, China farmers have already solved their living problem. They pursue for a well-to-do living and a better life in stead of simple survival. How can they start a revolution or insurgence at the price of lives? Therefore, we should permit the foundation of agricultural cooperatives inwardly and theoretically.

Some people may question whether agricultural cooperatives can benefit the construction of rural social capital. The answer is yes. In China, farmers do not have a powerful organization that represents for farmers' interests. Therefore, even if the law endows farmers with certain rights, these rights can not be carried out if the government does not support farmers and fails to insist on self-discipline. Only when farmers combine together to form an organization with solidarity, can they protect their position in social wealth's re-distribution and relevant rights. The organization that possesses powerful strengths in negotiation and the institutional arrangement for farmers in social wealth's re-distribution form the rural (farmer) distributive social capital. Moreover, the agricultural cooperatives with serious organization can not only improve farmers' position in social wealth's re-distribution, but also benefit the cooperation of agricultural production, which founds the rural productive social capital.

To a further degree, the distributive social capital is to provide with a social acceptable interests structure and a stable profit-encouragement mechanism for agricultural production. Here the so-called social acceptance means that the returns of production capital, circulation capital, and interest capital can achieve a basic equilibrium. Under

China's traditional smallholder farming environment, agriculture is the most fundamental production ring. Its modernization has to depend on accumulation and support for science and technology, capital, and policies. And the high-tech assistant resources needed in its further development rely on high returns. The agricultural cooperatives can help to express farmers' political and economic needs by proper ways. It can also help agricultural production and business activities to win wide social acceptance. The productive social capital chiefly focuses on the introduction of social capital, management, and relevant services. The history of China's agriculture development shows that farmers are not short of spirits of intensive cultivation. They just can not resist the huge impact low costs generated by modern agriculture, such as machines, sciences and technologies. Therefore, the effect of agricultural cooperatives is "combination", dislocating the high costs in the process of modernization. However, the cooperatives are different from special cooperation. The cooperatives are based on experiences of special cooperation. Associate separate farmer together, associate together to introduce special management talents, special consulting services, and associate to ask for political right and enhance the power in negotiation. The foundation of agricultural cooperatives can combine separate farmers together, realizing the scale operation of agriculture, and improving agricultural development and operation level.

The next question is how could we construct the unified agricultural cooperatives that represents for all farmers' interests? Under the present arable land system in which the ownership of land belongs to the country and farmers have the beneficial right, and with the restraint of natural capital that the average arable land possessed by farmers is two acres per capita, it is hard for farmers to form the widely-accepted agricultural cooperatives. In other words, for a long period, it is impossible to constitute the ideal agricultural cooperatives, unless we speed up the integration of arable land. Obviously, the speeded integration of arable land without considering sustainable economic growth and social stability is not practical or worthy. But, as long as we do hope for the appearance of a new countryside with "developed production, well-to-do living, polite ethos, clean environment, and democratic management", it is fundamental to allow and drive the development of agricultural cooperatives. The faster the agricultural cooperatives comes into being, the nearer the new countryside is.

#### *4.3 Revelation and reference from the development of Japanese Agricultural Cooperatives*

Why we discuss the experiences of Japanese Agricultural Cooperatives' development includes two reasons. Firstly, Japan and China adopt a similar political system, emphasizing on the centralization of state power. Administrative orders are from the top level to the lower level. Besides, the two countries have lots of similarities in some aspects, such as the similar natural restraints and the main production ways (separate smallholder farming), the deficiency of arable land per capita, the short of natural capital, and the weak agricultural basis. Secondly, Japanese Agricultural Cooperatives have gained a great success after years of accumulation. It contributes a lot to Japanese agriculture and economic development. We should take references from its successful experiences, because exterior favorable experiences and revelation can help to save costs of reform effectively. In other words, if we can use Japanese Agricultural Cooperatives' successful experiences for reference effectively and combine these experiences with China's practices together, the agricultural cooperatives will step into a way with China characters based on exterior experiences and inner reform. Enrich the rural productive social capital and the distributive social capital rationally. As a result, many problems may be solved completely, such as the low income of farmers, the grain productivity, and the new rural construction.

Experiences of Japanese Agricultural Cooperatives' success chiefly include these aspects as follow: the close organization, the wide participation, the comprehensive service function, and the democratic management. From these successful experiences we notice that Japanese government strives hard for the enrichment and construction of farmers' social capital (some people think that the government has to take farmers' interests into consideration because they hold political votes. But here we do not discuss this issue). Firstly, Japanese Agricultural Cooperatives' development has strong institutional basis. The state takes the institution of agricultural cooperatives as an organizational measure for agricultural development. One of important reasons for Japanese Agricultural Cooperatives' fast development is its legal social position at its initial stage. Since the reform of industrial organization in 1947, Japanese Agricultural Cooperatives have been regulated by the Law of Agricultural Cooperative Combination. Besides, Japanese government continues to amend former laws and constitutes new laws along with economic development and environmental changes, what serve as reliable legal basis for Japanese Agricultural Cooperatives' all activities. In this aspect, considering the popularization of institution economics in China, the great achievements in the thirty-year's implementation of reform and open policy, and the absolute authority of government, we can easily solve the issue of institutional reform and guarantee. The urgent issue for us is to think about how to deal with the resistance from interests groups and the effects generated by the implementation of institutions and laws.

Secondly, Japan does not possess rich natural conditions and land resources. Farmers are engaged in separate family



operations. Therefore, the growth of Japanese Agricultural Cooperatives and the development of agriculture have to depend on government's supportive financial policies. Otherwise, the growth and the development are impossible. Because of enormous financial allowance from the government, Japanese Agricultural Cooperatives have obtained rich natural capital at the initial stage, what creates conditions for the construction of farmers' productive social capital. But considering China's situation, although the No.1 document extremely emphasizes on the "three rural, farmer, and agricultural issues" and the government adds more and more compensation for agriculture, the effect is small because of the large population of farmers and the too-much levels of governments. In other words, if we pursue for the construction of agricultural cooperatives, we have to firstly reform the levels of administration.

Thirdly, Japanese government pays more attentions on the construction and enrichment of Agricultural Cooperatives' productive social capital. At present, Japanese government provides with billions of Japanese Yen for agriculture annually, chiefly using for the construction of irrigation works and the price compensation for agricultural products. Together with the financial policy, Japanese government provides with low-interest loans for farmers with the intention of solving the deficiency of agricultural capital. Meanwhile, the Agricultural Cooperatives enjoy a more favorable tax comparing with common private enterprise. For example, the law of monopoly is not right for Agricultural Cooperatives' products and capitals. The legal tax of Agricultural Cooperatives is lower 10% than that of common enterprise. Japanese government tries to popularize agricultural science and technology by many ways. It aims at training agricultural talents by flexible forms, adopting both formal education and social education at the same time. The Agricultural Cooperatives have complete education system. It cultivates talents with the spirit of coordination and cooperation. The government helps to construct the Agricultural Cooperatives' Central College. In local area, there are 41 colleges of Agricultural Cooperatives and kinds of training centers. Besides, the agricultural operation services and agricultural improvement and popularization industries (such as agricultural testing ground, and agricultural technology prevailing stage) that aim at teaching farmers agricultural technologies and new scientific knowledge, and transmitting agricultural business information, market trends, and new breed information to farmers are popular in the whole country. In China, although the activities of sending science, technologies, medical care, and sanitation are popular at present, it does not form an institutional arrangement. After all, the knowledge transmitted in a short holiday is limited. Farmers are not good at absorbing and consuming the new knowledge, what is caused by the extremely shortage of teaching talents because of the deficient investment in rural education and the problem of encouragement. As a result, the agricultural production in China mostly depends on experiences. Therefore, we should emphasize on improving farmers' knowledge storage and agricultural technologies by introducing social power, adjusting training thoughts, combining formal education and social education, grassroots popularization and specialty training.

Besides, the nationality of Japan is also one of experiences for the success of Japanese Agricultural Cooperatives. Japanese have strong consciousness of group affiliation, emphasizing on solidarity and coordination. Therefore, the cooperative thought is in accord with Japan's solidarity. The cooperative thought firstly appears in commercial industry. The characters of agriculture determine its dependence on natural conditions and environment. Plus the separate family operation, it is hard for the agriculture to defend the double risks from the nature and the market. Therefore, the cooperative economy gains complete development in agriculture field. In a sense, the Japanese Agricultural Cooperatives reflect the solidarity of Japan in rural area. However, in China the consciousness of group affiliation and coordination is not strong. Chinese emphasize on elites and talents. So, the successful construction and development of agricultural cooperatives in China have to rely on appearance of excellent leaders. At present, a wonderful way is to select the college student with both morals and abilities to manage a village. We should normalize this way and take it as an institution for a long time.

#### *4.4 The system innovation serves as a guarantee for the foundation of agricultural cooperatives and its development.*

After we introduce the development of Japanese Agricultural Cooperatives and its successful experiences, what can we do at present, considering China's situation? Firstly, besides permitting the foundation of agricultural cooperatives, the government should create conditions for agricultural cooperatives' foundation and development at the right time. In authors' opinion, only by system innovation can the foundation of agricultural cooperatives and its development be guaranteed. To cancel the governments at villages and towns is an important fundamental reform for the development of agricultural cooperatives.

Cancel the governments at villages and towns. Reasons are as follow. Firstly, leave spaces for the foundation of agricultural cooperatives and its development, which represents for farmers' interests in deed. Under present system, it is impossible for the appearance of a powerful organization that may confront with local governments. Secondly, to realize farmers' self-governance, the governments should not control too much (for example, the government should not interfere with the selection of rural residents committee, and the rural production). However, the

governments at the villages and towns always have the impulse of realizing their authorities. Thirdly, in the financial aspect, many governments at villages and towns can not achieve income-and-expense balance because of the deficiency of financial capitals, the overstaffed offices, and the remission of agricultural taxes. Therefore, it is urgent to simplify the government structure. To cancel the governments at villages and towns has the smallest resistance and the highest feasibility. Besides, by canceling the governments at villages and towns and referencing from the institutional innovation in Zhejiang province where the “province-manage-county” system achieves nice effects in practice, China’s administrative levels can controlled effectively. Undoubtedly, it will establish firm basis for the implementation of central government’s capital compensation for farmers, countryside, and agriculture, and also leave spaces for the foundation of agricultural cooperatives and its development.

Secondly, the government should adjust its thoughts, insist on the way of developing agricultural cooperatives, turn the law of rural special cooperative organization to the law of agricultural cooperatives, reduce the costs generated by the “indirect path”, integrate farmers into a powerful organization, enrich farmers’ social capital, and enhance farmers strengths in negotiation. Just as what was discussed above, it is impossible to complete the construction of agricultural cooperatives one night. We can set up pilot areas for the construction and development of agricultural cooperatives by referencing from the implementation of reform and open policy.

Any new thing will come across problems at the very beginning. The agricultural cooperatives are not an exception. In order to achieve a fine and fast development of agricultural cooperatives, we should continue to made institutional innovation, restrain local protectionism effectively, enlarge the scale of agricultural cooperatives, and enhance the competence of local agricultural cooperatives. Agricultural cooperatives can enlarge its scale by these ways as follow. Firstly, it is the combination. Several agricultural cooperatives combine directly. That is the main way to enlarge its scale. Secondly, agricultural cooperatives set up an association in certain aspect or sign certain agreement to achieve coordinative operation. But all agricultural cooperatives sustain their independence. Thirdly, agricultural cooperatives enlarge their scales by self-accumulation. Fourthly, reform the organizational system, by which agricultural cooperatives can reduce middle rings, decrease costs, and improve efficiency. Considering specific situations, we can turn the “base-county- central” three-level organizational system to the “base-central” two-level organizational system. In other words, integrate the county cooperatives into the national cooperatives and form the central-base organizational system. We can also integrate base agricultural cooperatives and form wide agricultural cooperatives (still base agricultural cooperatives). Besides, the agricultural cooperatives should enhance the organizational construction, simplify the institutions, and improve the service efficiency. In order to guarantee the proper operation of agricultural cooperatives, the government should amend relevant regulations in laws in time.

Besides, in order to enrich farmers’ productive capital successfully, agricultural cooperatives must introduce corporate management mechanism. Considering the nature of agricultural cooperatives, as we introduce the corporate management mechanism, we should combine it with the principle of cooperative operation in order to ensure that the operation of agricultural cooperatives does not disobey the fundamental principle of being farmers group and the cooperative economic organization.

## 5. Conclusion

In a word, if we want to realize the goal of new rural area with “developed production, well-to-do living, polite ethos, clean environment, and democratic management” and make it sustainable, we should construct rural (farmers’) productive social capital and (wealth) distributive social capital, besides enriching rural natural capital by absorbing social strengths. In order to construct rural (farmers’) social capital successfully, the government should grasp opportunities to create proper conditions for the foundation and development of powerful agricultural cooperatives that represent for farmers’ interests indeed.

Theoretically, the foundation of agricultural cooperatives can effectively improve farmers’ position and political rights. But in practice, it faces up with huge obstacles, including not only the resistance from interests groups, and the games between different interests groups, but also problems, such as how to solve local protectionism effectively, and the organization and integration of farmers. And even the pilot issue is extremely complex. Although difficulties are numerous, to found and develop agricultural cooperatives is an irreversible trend for the long run. What we should do is to hold firm confidence and solve problems in the foundation and development of agricultural cooperatives based on further discussion.

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# The Cultivation of Cluster's Sustainable Competence Based on Knowledge Management

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## Abstract

The cluster has shown its powerful competitive advantages in global competition. However, as amounts of industrial clusters have displayed their competence, some have lost their competitive advantages in global competition. It is meaningful for clusters' development to cultivate their sustainable competence. This paper analyzes the sources of cluster competence. According this paper, the important ways to make cluster competence sustainable include transferring and sharing knowledge, making innovation in the cluster, absorbing knowledge from other outer sources, and cultivating unique and exclusive knowledge innovation capability that is differing from other clusters. This paper advances two ways for clusters achieving the transformation from closed knowledge system to open one: firstly, cultivate the capability of absorbing new knowledge from other local knowledge sources; secondly, improve the capability of knowledge share and innovation in the cluster.

**Keywords:** Cluster, Sustainable competence, Cultivation

## 1. Introduction

Since Marshall studied the cluster phenomenon, relevant discussion concerning with cluster competence has gained numerous attentions. Hengjiang Liu and Jiaoxiang Chen explain the meaning of cluster competence from aspects of factors, structures, and abilities (Hengjiang Liu, 2004, p2-9). Tichy (1998) summarizes the life cycle of industrial clusters based on the prosperity and decline of corporate clusters. Jiankang Huang (2004, p39-71) discusses the cultivation of industrial cluster's sustainable competence from an angle of competitive advantage rigidity. Pekka Yi Anttila thinks that cluster competence is chiefly coming from its innovation, learning, resource integration, and capability, emphasizing on improving productivity and innovation performance, exerting positive specialized effect, pushing positive externality and knowledge overflow (Pekka, 2004). Based on these researches and combined with theories of knowledge management, this paper discusses the cultivation of industrial cluster's sustainable competence.

## 2. Cluster competence

Porter is the representative of factor theory. Regarding the cluster as a unity, its competence is determined by four associated factors: corporate strategy, structure and competitor; demand; relevant supportive industries; factors situation, including climate, supply of labor and technology, payments, living costs, taxes, research institutes, official support, etc. These four factors affect one another, forming the industrial cluster competence. Ahuja (2000, p425-456), Krtke (2002, p27-54), and Tracey (2003, p1-16) are representatives of horizontal structure theory. In their opinion, enterprises in one cluster associate with one another in production, market, technology, purchase, and infrastructure. Meanwhile, there is a competitive and cooperative relationship between them based on fame, friendship, mutual dependence, and mutual benefit. Industrial cluster is kind of net organization with the property of economy, society, and self-learning. Industrial cluster competence is composed of degree of functional difference, net density, net cohesion, net integration, and net infrastructure quality. According to the theory of capability, cluster competence is chiefly coming from innovation, learning and sources integration, emphasizing on abilities of improving productivity and innovation performance, exerting positive specialized effect, pushing positive externality and knowledge overflow, enhancing corporate coordination effect, and occupying global market share (Pekka, 2004). All these opinions indicates that cluster competence is to take the cluster as one unity and investigate its level of competence in the global competition, emphasizing on how to integrate cluster's inner sources and adapt to outer environment.

Different schools hold different opinions toward cluster competence's sources (Bufang Wang, 2004, p12-16). Classic economics chiefly studies comparative advantages related with cluster industry based on division of labor, emphasizing on "special difference", namely the unbalanced distribution of non-flowing factors (such as mines, and certain production factors). New classical economics studies micro economic activities and macro economic growth under the assumption of perfect competition market structure and unchangeable production function returns to scale, regarding the flow of factors as instant and costing none. As economic operation strays away from original equilibrium, market economic system has a power of self-recovery. New classical industrial cluster theory emphasizes on knowledge overflow caused by geological closeness, and static and dynamic special externality. The typical transmit medium is the communication of labors (engineers, scientific researchers, and specialized workers in general) in cluster region. New trade theory probes into specialization and trade mechanism based on imperfect competition and idea of increasing return, which is similar to the conglomeration phenomenon discussed in theory of traditional economic geography. The representative fruit is Krugman's core-periphery modal based on increasing returns to scale, emphasizing on the cultivation of industrial cluster competence based on regional economic integration, market capacity, and law of increasing return to scale. According to new growth theory, the economic growth originated from endogenous technological progress is reflected by factors' increasing marginal return caused by the imbalance of regional economic growth, the technological externality generated by conglomeration, and the monetary externality, which will lead to the special conglomeration of economic activities. New institutional economics regards the cluster as a special result from enterprises' vertical decomposition, thinking that as enterprises achieve vertical decomposition, the level of external transaction activities will be improved. Enterprises that have economic relationships will gather together, what can help to decrease transaction costs. New economic sociology emphasizes fully on the effect of non-market relationship, such as trust, custom, cultural structure, and non-coded knowledge, among members in one cluster on industrial cluster. The source of industrial cluster's competitive advantage is changed from "economic factors", such as external scale economy, to "social- cultural regional root", such as the mutual effect of non-market forms that include trust and non-transaction independence. The school of competitive advantage, represented by Porter, thinks that cluster's sustainable innovation advantage is coming from cluster's organizational structure advantage, competition advantage, cooperation advantage, and cultural advantage.

To sum up, along with the evolvement of economic environment and competitive state, sources of cluster competence possess different features. For example, at the industrial economic times all scholars emphasized on cost advantages that are based on the appearance of cluster, which leads to consume less available materials, such as common facilities and resources. However, along with the development of times and the changes of competitive factors, knowledge becomes the key factor for corporate, regional, and national competition more and more. Meanwhile, because of further conglomeration of clusters and increase of environmental costs (such as pollution centralization), costs of material factors (such as land price in the cluster) tend to increase due to fierce competition and increasing participants. Costs of cluster based on material sources restrain its further development. In order to obtain competitive advantages for a cluster under the knowledge economy background, knowledge and technology becomes more and more important (N. Dayasindhu, 2002, p551-560; Martin Bell, 1999, p1715-1734). The competitive advantage of cluster exists in knowledge innovation capability.

### **3. The evolvement of knowledge and cluster competence**

Cluster competence's another important fruit is cluster's life cycle. Tichy (1998) thinks that industrial cluster has four life periods in one life cycle: the emergence phase, the growth phase, the maturity phase, and the decline or rigidity phase. It is showed in table 1 as follow.

According to table 1, at the growing phase and the maturing phase, the cluster has the most energetic vitality, the most powerful capabilities of knowledge learning and innovation, and the strongest competence. The knowledge accumulation of one cluster, as the initial conditions for its competence, determines the cluster's initial competence. The knowledge increment, as the representative of cluster's capabilities of producing and obtaining knowledge, determines the formation and improvement of cluster's dynamic competence. At different phases of cluster's life cycle, the important ways to sustain cluster's openness for the sake of extending its life cycle include knowledge transfer, share and innovation, absorbing knowledge from outer sources, and cultivating unique and exclusive knowledge innovation capability that is differing from other clusters.

Cluster's knowledge accumulation and knowledge increment determine the capability of cluster. Specific process is shown in figure 1. Thereof, T refers to cluster's life cycle, C cluster's competitive advantage.  $S_1$  reflects the evolving process of cluster competence under a closed condition. Curve  $S_1$  shows that at the primary phase of cluster's life cycle (the 0- $T_1$  part) the cluster advantage rises because of cluster's scale economy and share of public goods. After the cluster reaches the point of  $T_1$ , cluster competence begins to decline gradually and finally disappears because of

“regional lock”, cluster rigidity, loss of flexibility, and slow response to outer changes. As the cluster stays in an open system, its competence becomes sustainable by means of knowledge transfer, share and innovation, absorbing knowledge from outer sources and cultivating unique and exclusive knowledge innovation capability that is differing from others. The cluster competence’s declining time changes from  $T_1$  to  $T_2$ . In figure 1, it is  $S_1 \rightarrow S_2$ . Therefore, if a cluster pursues to obtain sustainable competence, its knowledge activities become extremely important.

#### **4. The cultivation of cluster’s sustainable competence: an open knowledge system**

According to former analysis, as the cluster arrives its declining phase, it begins to be aging and its competence decreases. Besides, the “regional lock”, cluster rigidity, loss of flexibility, and slow response to outer changes contribute to the decrease of cluster competence. New economic sociology pays more attentions on this issue. Institutions, in the essence, are frequent net mutual effect among people, having strong path dependence. In one cluster, institutions’ path dependence can provide with explanations for the emergence of effective customs and norms. Similarly, as the cluster’s outer technological conditions change, the path dependence of net may lead to sorts of lock effect in the cluster, and even the decline or death of the cluster (Jingjun Lin, 2004, p45-47). The most important reason for the decline of steel industrial cluster in Germany Ruhr are functional lock, recognition lock, and political lock caused by path dependence (Grabber, 1993).

Porter thinks that it is net structural hole that weakens cluster competence (Bufang Wang, 2004?, p12-16). Unilateral and powerful localized net may turn local cluster into a closed and rigid production system. On one hand, if the transaction relationship between enterprises benefit certain specific partner, the enterprise’s flexibility in market will become weak. For example, the excessive solidarity among enterprises in one local cluster will weaken not only the competition but also enterprises’ motive to pursue for development. On the other hand, the high similarity of connection structure will lead to the decrease of cluster net structure hole and homomorphism of net structure. As a result, local clusters can not get external new information and gain new opportunities. The rigid mechanism and the absence of innovation atmosphere will kill the possibility of cluster innovation. Because of the globalization of market and capital, knowledge activities should not be limited to paths in one cluster. It is a must to realize global knowledge learning and resource share and allocation, making best use of external knowledge sources based on localization (Bufang Wang, 2004, p12-16). The cluster has to turn the closed knowledge system into an open knowledge system in order to retain sustainable competence (N. Dayasindhu, 2002, p551-560). Martin Bell describes characters of closed and open knowledge systems. Based on his researches, we use table 2 to describe the two systems’ characters respectively.

In order to realize the transformation from a closed knowledge system to an open one, it is necessary to improve cluster’s capability of absorbing and integrating knowledge from outer sources, and capability of knowledge share, transfer and innovation. In specific, it includes two aspects.

##### *4.1 Cultivate the fundamental capability of absorbing knowledge from outer sources*

The knowledge rooted on cluster’s local cultural characters, especially the implicit knowledge, is the key factor for the cluster obtaining sustainable competence under the global competition. Therefore, it is necessary to cultivate cluster’s fundamental capability of absorbing knowledge from outer sources. In specific, it refers to the capability of identifying, absorbing, and using knowledge from outer sources. The fundamental capability of absorbing knowledge from outer sources emphasizes on assimilating new knowledge from outer sources and combining with cluster’s internal knowledge and culture.

Cluster’s absorbcency is determined by each subject’s capability of absorbing knowledge from outer sources and their mutual effects in the cluster. The absorbcencies of each subject in the cluster are different, which is based on present knowledge accumulation and technological abilities. The accumulation of capacities is the function of time, experiences, practices, and efforts. And the accumulation of capacities is a gradual process of path dependence. Although the subjects in one cluster stay in the same macro environment and experience, they have different technological levels due to differences in development practices, experiences, efforts, and history factors (Lin Li. & Ling Yuan, 2004, p80-84). The knowledge gatekeeper who holds higher capability of identifying and absorbing knowledge and capability of innovation is decisive for the improvement of cluster’s knowledge innovation capability. Because the cluster has a networked organizational structure that is right for knowledge transfer and communication, once new outer knowledge has been absorbed by knowledge gatekeeper, the new outer knowledge will be turned into the cluster’s common language by the knowledge gatekeeper, which will finally become implicit knowledge or semi-implicit knowledge that can be transferred easily in the cluster. Therefore, it is the knowledge gatekeeper who determines cluster’s capability of knowledge innovation. It has significant effect on the cultivation of cluster’s sustainable competence to cultivate and inspire enterprises in one cluster to turn into knowledge

gatekeepers. For clusters that are developed from institutions with knowledge advantages, the knowledge gatekeepers will come into being during the evolvement of clusters. For example, in the cluster that takes large enterprise as the core, the large enterprise will become the natural knowledge gatekeeper. But for clusters formed by small- and medium- enterprises, all members do not possess prominent comparative knowledge advantages. Therefore, the cultivation of knowledge gatekeeper becomes extremely important. To cultivate and inspire some enterprises in one cluster to turn into knowledge gatekeepers, the outer policies serve as important drives. The primary principle of these policies is to make knowledge leaders gain higher profits than the average.

#### *4.2 Improve cluster's knowledge share and capability of innovation*

The cultivation of cluster's sustainable competence emphasizes on not only knowledge gatekeeper absorbing new knowledge from outer sources, but also the knowledge share among members in one cluster and the cultivation of innovation capability. Knowledge share and innovation capability are affected by characters of knowledge, knowledge receivers, knowledge senders, relationship of cooperators, knowledge transfer mechanism and reliable carriers and tools, and environmental factors. The cluster, as a typical net organization, has special advantages of knowledge share and innovation. For example, special closeness makes face-to-face communication more convenient (such as coffee bar effect). Public facilities decrease costs of knowledge share and innovation. Social net makes trust becomes possible. Embedment makes the communication of semi-implicit knowledge possess "mutually-identified group". All these provide with convenience for knowledge share and innovation. Along with the lapse of time, knowledge innovation capacity will be restrained. In order to cultivate sustainable knowledge innovation capability, we should make best use of network, artificial intelligence, neural net, group, and other relevant technologies to construct an open interacting technological platform, creating suitable "places" and platform that is right for knowledge share and innovation.

The more important is to inspire and cultivate cluster's knowledge innovation capability by constituting cluster policies (Hengjiang Liu & Jixiang Chen, 2004, p36-43). In specific, train and develop brokers (or medium agencies). For example, by founding scientific garden, we can create a platform for scientific researchers, entrepreneurs, and financiers communicating with one another. Set up business incubator and constitute cluster innovation system. Support public-private cooperation and enhance knowledge communication among enterprises. Make up rational system and guarantee for normal and frequent cooperation (but not occasional relation or level relation). Create an atmosphere of learning. Strengthen the knowledge overflow and net innovation mechanism. Perfect the training policy that can provide with intelligent support for labors in cluster, improving cluster's capability of knowledge share and innovation, which can endow the cluster with excellent technology base. The core of training policy is to establish the professional training program.

In the constitution of cluster policy, the government should make up proper cluster policy based on different clusters correspondingly. For the cluster that emphasizes on knowledge factors, the government should play a role of server, avoiding too much interference. The cluster policy should lay stresses on the knowledge and technological innovation and communication, the specialty knowledge and technological training, and the introduction of innovative intelligent capital, constructing a coordinative net among enterprises, and providing with exterior conditions for knowledge share and innovation in the cluster. But for the cluster that has a low degree of knowledge dependence, the government should take a part in the cluster properly. The cluster policy should lean to providing with infrastructure, public goods, services and capitals, and even wide professional training. By this way, the government can help the cluster improve its knowledge innovation capability and guide it to make strategic transfer toward the industry that lays more stresses on knowledge.

### **5. Conclusion**

By analyzing cluster competence's meanings and sources, this paper concludes that the lock effect and the net structure hole are the main reasons for the decrease of competence as the cluster develops into certain phase. Therefore, the important ways to make cluster competence sustainable include: enhance the knowledge transfer, share and innovation; absorb new knowledge from outer knowledge sources; cultivate the unique and exclusive knowledge innovation capability that differs from other clusters. Based on that analysis, this paper advances two ways for clusters achieving the transformation from closed knowledge system to open one: firstly, cultivate the capability of absorbing new knowledge from other local knowledge sources; secondly, improve the capability of knowledge share and innovation in the cluster.

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Table 1. The change of the cluster's competitive advantage during the lifecycle

Life cycle	Characters of competence
Emerging phase	Competence comes into being but is short of stability; high specialization and prominent cost advantage; powerful economic energy; insufficient innovation capability; net effect between enterprises is weak and is affected heavily by environment.
Growing phase	Competence grows fast; more flexible production and stronger specialization; net effect between enterprises tends to be stable and begins to exert effects; improving innovation capability and brand advantage; government behavior and exterior new product's test-market begins to improve cluster's capability of adapting to environment and taking advantages over environmental resources.
Maturing phase	Stable competence, standard production, prominent effect of scale; collect lots of technologies and talents, and strengthen self-innovation capability; participate in international market competition, and occupy one-up market share; high credit of cluster brand; decrease of commercial costs; escape from environmental risks and catch market opportunities with agility.
Declining phase	Competence decreases; be stricken by sorts of risks; insufficient development vitality; capabilities of making product innovation, competing in international market and adapting to environmental changes decrease obviously; lose competitive advantages gradually.



Table 2. The characters of the closed and open knowledge system

Factor	Closed knowledge system	Open knowledge system
Base for knowledge diffusing in small enterprise	Emphasize on special closeness and passive knowledge overflow	Formulated and active cooperation
Dominant direction of knowledge flow	Horizontal knowledge flow: flow and transfer in enterprises that produce same products	Vertical: product's supply chain
Training institution's effect	None or temporary	Common or continuous existence
Task of large enterprise	Unimportant, non-structural, passive	Important, continuous, organizational cooperation, active
Knowledge capacity	Get and obtain knowledge from small-volume knowledge	Obtain knowledge from large knowledge capacity
Source of new knowledge	Chiefly created by subjects out of the cluster	Chiefly created by subjects in the cluster
Channels of external resources	Limited and informal channel	Common and formal channel, formal knowledge keeper
Types of learning	Learning as by-product	Searching with goals

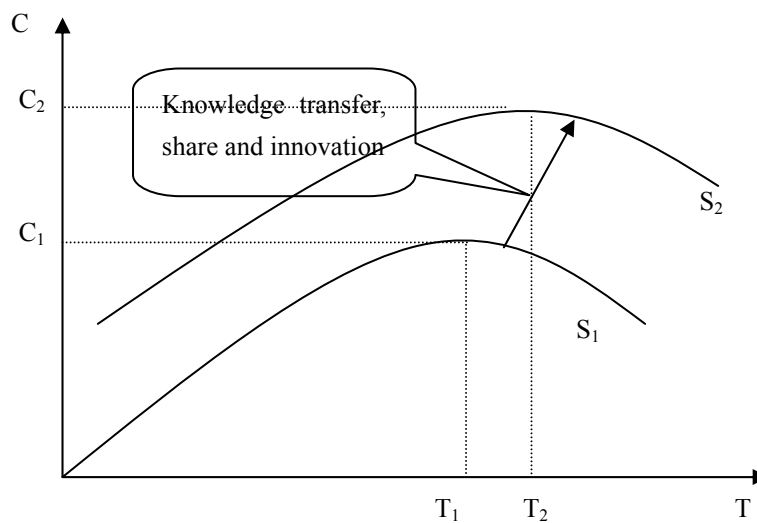


Figure 1. The Relationship between Knowledge and Cluster's Competitive Advantage

# Study on Selection of Logistics Mode for Enterprises Based on Transaction Cost

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## Abstract

The logistics mode plays a critical part in the success or failure of the enterprise logistics operation. It effects enterprise's whole state of operation. The transaction cost theory not only may be applied to the enterprise fundamental theory research, may also be applied to the process of choosing enterprise logistics mode. Based on the analysis of three types of logistics mode for enterprises from transaction cost angle, such as the Self-conducting Logistics mode, the Third Party Logistics mode and the Integration Logistics mode, this paper has pointed out the respective usable condition.

**Keywords:** Logistics Mode, Self-conducting Logistics, The Third Party Logistics, Integration Logistics, Transaction Cost

## 1. Introduction

Along with the development of economic, logistics has already become one of the key factors in the success or failure of enterprise and the suitable logistics mode is the premise of success. Many factors will influence the choice of logistics mode. This paper discusses the question of logistics mode's choice question based on the transaction cost theory.

## 2. Review of transaction cost theory

Coase who was a British economist proposed the transaction cost theory by, but he did not give systematic explanation to the reason of transaction cost and its determining factor. Followed him, Williamson researched the determining factor of transaction cost systematically. Williamson thought that human was "limited rational"; at the same time, human was not only selfish, moreover, so long as it can benefit themselves, they would do not hesitate to harm others. Human's this natural instincts is called opportunism. The opportunists, when it is possibly to increase their profit, will dare to violate any warns, will send out distorted information to mislead other people intentionally, and will intend to make the information anisomerous. In this kind of situation, adopting measure to hold back opportunistic behavior is economic significant to economics and will bring out new cost.

Williamson has studied the determining factor of transaction cost from three dimension. The first factor is asset specificity, it implies that it is difficult to move the resource for other use after it is used in some specific use. This nature has different degree in different resource and in different use. The second determining factor is uncertainty of transaction, which is the primary reason for the "limited rational", including accident's uncertainty which can be forecasted, but the cost is very high for the forecast of the uncertainty or doing some measure to hold it back. The third determining factor is the frequency of transaction.

Although the transaction cost theory is mainly used in the enterprise theory and the organization behavior theory, the property right economics and the legal economics, its related conception and the method are suitable for analyzing the logistics mode's choice of enterprise.

## 3. The transaction cost analysis and choice of enterprise logistics mode.

### 3.1 The alternative logistics modes

Logistics mode refers the basic philosophy in the process of enterprise's logistics operation. It is the organic complex compound of the type of organization, operation mechanism and guarantee system. Generally, the main modes

include the Self-conducting Logistics mode, the Third Party Logistics mode and the Integrated Logistics mode.

The Self-conducting Logistics mode refers the enterprise establishes logistics system which is suitable for its own management characteristic depended upon its own resources. The enterprise finishes all work from the purchase of raw material to the finished product production, the storage, the processing, the packing and the transportation by itself. The self-conducting logistics mode requests the enterprise with high operation level, it requests the enterprise can efficiently combine the product fluxion, commercial fluxion and information fluxion together .then it can display the self-conducting logistics' superiority fully.

The Third party logistics (3PL) mode refers that the enterprises focuses on its principal work outsources the logistics work which was done by itself originally. The enterprises can manage and control all the logistics process efficiently by communicate with the logistics service enterprise, through the information system . This kind of logistics activities which undertook by the third party may contain the entire logistics flow or some parts of it.

The Integrated Logistics refers the enterprise's logistics activity is partial outsourced to the third party logistics enterprises and partially is operated by themselves.

### *3.2 The transaction cost of enterprise logistics operation*

From seeking for the transaction partner to the logistics business's completion, the enterprise will afford the following transaction costs:

#### *3.2.1 Search cost*

The enterprise needs to seek for the partners which can provide service to it, but the enterprise is nor sure about the possible partners' serviceability, prestige and so on various aspects of information. The information is asymmetrical. The enterprise needs to spend certain manpower, physical resource and financial resource in collecting and evaluating the related information.

#### *3.2.2 Negotiations cost*

After choosing partners, the enterprise needs to carry on the consultation negotiations with the partners. In the negotiations process, all quarters hope to obtain one advantageous result, so they will bargain back and forth. Then the negotiations cost becomes the cost could not be neglected in the process of choosing logistics mode.

#### *3.2.3 Performance cost*

Whether the collaborators can fulfill the agreement according to the contract standard has some risk. Unconsistency will accompany with the implementation of contract and cause losses. Taking measure to minimize this kind of loss also need to pay cost.

#### *3.2.4 Risk cost*

The stability and security of cooperation are very important to the enterprise. Any one of the collaborators' significant adjustment about equipments or products will influence other collaborators badly and causes cost increasing. This kind of influence possibly will even be ruinous sometimes.

#### *3.2.5 Other cost*

It mainly includes those cost increased by the factors impossibility to be forecasted, such as natural disaster.

### *3.3 Analysis of factor influencing transaction cost*

The paper analyzes transaction cost from asset specificity, the uncertainty and frequency of transaction.

#### *3.3.1 Asset specificity*

If the enterprise's investment has no asset specificity or the level of asset specificity is very low, then when one side of the trade has opportunistic behavior, another side will find right replacer in the market easily, so the loss will be limited,if the asset specificity level is very high, it will be very difficult for the enterprise to find appropriate transaction replacer, the investment property was also very difficult to be moved for other use, even if it can be used again, the sunk cost will be tremendous. Moreover the feature of asset specificity determined transfer quantity should be stable and continual. In brief, the existence of asset specificity enabled the opportunism behavior to be possible, moreover the higher the asset specificity level the more possible to be coerced for the enterprise. Therefore, higher the asset specificity level is, closer the enterprise should pay attention to the Self-conducting Logistics mode.

#### *3.3.2 The uncertainty of transaction*

Higher the uncertainty of transaction level is, huger the possible performance cost and risk cost will be. So the logistics mode should trend to marketised mode.

### 3.3.3 The frequency of transaction

The frequency of transaction has huge influence to transaction cost. When the times of transaction are limited, then the scale of investment is increased invisibly. The frequent transaction is advantageous in sharing investment, moreover the frequent transaction can increase the understanding and the trust between all collaborators and reduces the opportunism behavior, then the transaction cost reduces greatly. The relation between transaction cost and the times of transaction is implied as figure 1 (TC is transaction cost, N is the times of transaction).

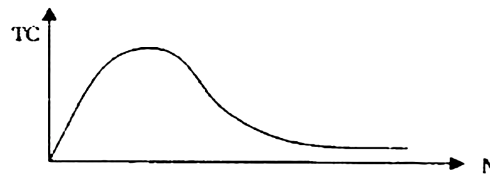


Figure 1. Graph of the relation between transaction cost and the times of transaction

### 3.4 Analysis of enterprise logistics mode's transaction cost and the choice of mode

If the asset specificity level is low, the enterprise could adopt the self-conducting logistics mode or those marketized mode.

The Third party logistics mode can decrease transaction cost effectively compared to the traditional one to one logistics mode from the following aspects: (1) An enterprise only needs to cooperate with several even one logistics service enterprise, thus the logistics link can be able to reduce as far as possible, the search cost was reduced greatly; (2) The logistics service provider provides service according to the enterprise, thus the customer keeps closely communication with facilitator. Both sides can know more well about each other, thereby, risk cost, negotiation cost and superintends cost are reduced; (3) The Third Party Logistics is one kind of long-term cooperative relation, so opportunism behavior occurrence possibility will be reduced, thereby, performance cost will be reduced effectively. But choosing the Third Party Logistics has a premise, which includes the asset specificity level and the uncertainty of transaction should be low. Otherwise the enterprise will suffer gigantic loss because of opportunism behavior.

We know from above that if the asset specificity level is high and the frequency of transaction is low the enterprise should adopt self-conducting logistics mode to take precautions for opportunistic behavior. At the same time the Organization cost will increase greatly. So the enterprise should compare Organization cost with transaction cost when it attempts to choose a logistics mode. The logistics mode chose should be able to win more net earnings than other logistics modes.

The cost of market-driven relocation of resources is expressed by  $C_m$ , namely the transaction cost. The integral organization's organization cost is expressed by  $C_f$ . The profit of market-driven relocation of resources is expressed by  $B_m$ . The profit of organization integrated is expressed by  $B_f$ . If  $C_m > C_f$  and  $B_m > B_f$ , looked from the transaction cost angle integral organization has advantage, but looked from the benefit angle the profitable way is market-driven relocation of resources. But  $C_m > B_m$  and  $C_f > B_f$  indicated that either the way of market-driven relocation of resources or the way of enterprise-driven relocation of resources is not feasible. In such a case, the enterprise might adopt Integrated Logistics mode, the enterprise can deal the part which has high asset specificity level with Self-conducting Logistics and deal the part which has low asset specificity level with the Third Party Logistics

## 4. Conclusion

In summary, asset specificity, the uncertainty and frequency of transaction all effect the transaction cost and are key factors in the process of choosing logistics mode. In the actual operations, the enterprise should also consider some other factors such as the quality of service. The enterprise should combine its own production characteristic and the market characteristic to choose logistics mode, at the same time, it should consider the subject range and advantage of every logistics mode. On the other hand, the enterprise must reform itself combining with the existing production and the sales model, analyze the feasibility and profit scientifically of every logistics mode, seek for the optimal combining site of production, sales and logistics. In addition, internal and external resource condition of the enterprise is also the factor influencing the choice of logistics mode.

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# The Essence of Chinese New Accounting Standards--accountants' Professional Judgments

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## Abstracts

Chinese new accounting standards, which are regarded as the milestone in the history of Chinese accounting, have caught people's attention since their publication in Feb.15th, 2006. The simplification of the new standards makes accounting more elastic, and more dependent upon accountants' professional judgments. This paper points out the important position of accountants' professional judgments in Chinese new accounting standards, by analyzing the profound connotation of Chinese new accounting standards and accountants' professional judgments.

**Keywords:** Chinese new accounting standards, Essence, Accountants' professional judgments

The history of accounting development indicates that accounting was born in the specific environment, and the development of its theory and practice is greatly propelled by the change of economy. Therefore, accounting standards, as the professional technology criterion for reflecting economic activities, confirming property relations and regulating the distribution of profits, should also develop with the pace of environment changes.

21st century is the age when high technology, as well as economic management has greatly improved. Under this circumstance, Chinese ministry of finance issued new accounting standards constituting a basic accounting standard, 38 specific ones and the application guide. The implementation of the accounting standards is of important significance to modify Chinese socialist market economy, promote the opening up to the outside and accelerate the integration of Chinese economy into the world.

Accounting standards have experienced over a decade of adjustments and revisions since the release and implementation of the "two standards and two systems" (Accounting Standards for Business Enterprises, The General Rules Governing Enterprise Finance, Enterprise Accounting System and Enterprise Financial System) in 1993, which is an unprecedented reform in the accounting history as it lasts such a long time, covers such wide ranges and involves such deep contents. In comparison with the old, the new accounting standards not only learn from the foreign precious experience, but also converge with the international practice in the aspect of choosing and applying accounting policies. Besides, it keeps Chinese characteristics in the disclosure of related party transactions, the switch back of the assets depreciation etc, which better meets the demand of the thinking mode and professional qualities of most Chinese accountants. Just as the former Finance Minister said, the new accounting standards, "the new milestone in the history of Chinese accounting and auditing", start a new stage with ending the old, symbolizing the convergence of CAS and IAS.

Accounting is a business language, the norms of which is accounting standards with the function to make stakeholders, like investors and creditors, understand the financial and operating situations of the enterprise. As accounting practitioners are the key to the implementation of the standards, it is necessary for them to transfer their accounting ideas, build a solid foundation of basic knowledge and skills, and make full use of their professional judgments. The new standards, either in accounting ideas or specific contents, are of unprecedented innovation, which add difficulties to the accountants' present work. What's more, the economic development leads to more fierce competitions and greater increase of risks and uncertainties, making the accounting environment and treatment more complicated. However, there scarcely exists an accounting policy or method which is applied generally and keeps stable, as the accounting standards can't cover all the realistic and potential transactions. In this situation, accountants' professional judgments seem particularly important.

A senior chartered accountant, in his book "Educate our students--what is our responsibility", wrote that, accounting

is mainly a matter in need of experience and judgments. Although the basic theory is not very profound, we may come across many difficulties when we attempt to apply it into the various and complex business environment. It is no doubt that the authenticity and accuracy of information are important, but the value of the information will be buried unless it goes along with the exploitation and training of accountants' judgments.....resolving business problems, requires accountants not only to master the order of facts, but analyze these facts carefully with logical reasoning and proper judgments. Apart from the general principles for accounting treatments, Accounting Standards for Business Enterprise make all the possibilities to supply the specific guide for the implementation of standards. Take the example of the standard on assets depreciation reserves. Although there are elaborate methods for confirming recoverable amounts, accountants inevitably depend on their knowledge, experience, preference and living environment to make a series of anticipation and judgments in the process of accounting treatments, due to the accounting itself. Just as Bruce. R. Jonas said results may be completely different, even though the accounting data is the same and dealt by equally eligible accountants.

Michael. Gibbins, and Elisite. K. Mason thought that if there weren't flexibility and intelligence brought out by professional judgments, the complex system made up of financial and accounting procedures and standards would be clumsy, unresponsive and insensitive. In short, the whole system would not work. Therefore, professional judgments greatly affect, even determine the accounting information, though much of it is digitized and regulated by standards, with the true and fair character.

As far as an accounting scholar concerned, judgments are just for you when you don't know what to do. It is one of the basic forms of thinking, namely, a thinking process of affirming or denying the things' existence, or pointing out whether things have certain attributes. The interpretation of judgments seems simple, but the process is possibly complicated as anything dubious needs judgment.

The change from judgments to professional judgments implies a more extensive process, as it requires people to have related professional knowledge and skills, as well as career morality. However, accountants' professional judgments are badly needed in search of conclusions when economic uncertainties appear, for the reason that both of the two skilled and experienced accountants will probably make different judgments which result in different accounting results, even they depend on the same economic information.

Professional judgments, which are preliminarily defined in the book "Professional judgments in the financial statement" written by CICA (Canadian Institute of Chartered Accountants), are a kind of judgments made by people who have abundant experience and knowledge with objective and upright attitudes in the area of career standards. Consequently, accountants' professional judgments refer to the ability that accountants in the uncertain situation fully consider about the present and future fiscal environment and operating character of the enterprise, then analyze, judge and decide economic transactions and matters in the light of accounting laws, standards and practices, as well as their knowledge and experience. Apparently, professional judgments aim at making accounting information relevant, reliable and conducive to the enterprise decision.

Accountants' professional judgments are influenced by many factors, such as the subjective, objective and environmental. The subjects are accountants who work dependently, the objects refer to economic matters or accounting treatments, and the environment means different environments of history, politics, law and technology. Accountants' professional judgments exist throughout the whole process of accounting and affect each stage that is the accounting recognition, measurements, records and reports.

Accounting standards, the behavior norms of accountants, play an important role in the accounting. And there are many reasons for their existence. As R. M. Skinner wrote in his book "The evolution of accounting standards", ".....each accounting standard is the substitutes of personal opinions or judgments, which is the significance of standards' existence. In addition, in the two research reports--"Professional judgments in the financial statement" and "Professional judgments in the auditing", CICA points out that "the function of accounting standards is to guide accountants' professional judgments, so they'll generate high-quality measurements and reports in any specific environment.

If there were not uncertainties and risks, judgments would be mechanical and results could be predicted, so the professional judgments would seem redundant. Because of the existence of uncertainties, the standards have supplied the only way of accounting treatments in many aspects of economy, which is the basis for decision-making and choice-limitation. Thus, this will make accounting information more valuable.

Judgments, in essence, mean risks. Thereby, accountants have to take risks when judging. Apart from the risks of which accountants are aware, there may be non-recognized ones due to personal limitation. While all the risks require the accounting sector to make standards.

Accounting has its subjective side. The subjects of judgments, namely, accountants' professional knowledge,

experience, morality, preference, as well as background of economy and culture, make the results of accounting treatments with the same information uncertain. In addition, the environments where they live and financial statements exist are always changing. The problems to be resolved continuously vary, but the methods might be not clear and stable. Therefore, there are almost no right answers, and the evaluation of judgment qualities depends on experts' consensus. From this viewpoint, making standards, in fact, is a process in the pursuit of the method for resolving common problems, while the standards themselves are the carriers of broadcasting the method.

The implementation of accounting standards is fulfilled by accountants, so do accounting supervisions including the examination and evaluation on the accounting qualities. Thus, accountants' initiatives play a leading role in the whole work, and accountants' professional judgments greatly affect the quality of accounting information.

Either in the principle-oriented or rules-oriented accounting standards, there is a public domain where accounting technique can not take effects. The principle-oriented standards need more and senior judgments with supervision of high level, for lack of their counterparty in the specific accounting rules. While the rules-oriented directly provide some options, from which enterprise accountants can choose. Obviously, the two accounting standards badly need judgments, as the undue application of accounting standards will result in serious economic consequences.

Liu Feng and Wang Bing have researched on the companies that simultaneously issued their A and B shares, at the background of the certain periods from year 1998 to 2000 during the accounting reform. They found that the differences between the reported net profits of those companies are not from accounting standards, but accountants' professional judgments. Besides, their research shows that accounting standards can't effectively coordinate the differences of accounting information which mostly comes from professional judgments rather than standards.

Compared to the previous, the new accounting standards become increasingly simplified and elastic. However, it is obviously impossible and unrealistic for rule-makers in any field to intentionally have standards cover all the economic activities of enterprises. Accounting and its environment are evolving, so the standards which worked well at one time may no longer take effects. What's more, the rate of standards-making is lower than that of the change of transactions and settlements brought by economic development and technological advance, which may lead to blanks of the standards. Under the circumstance, if judgments are not allowed, accounting standards will soon be useless. Thereby, judgments play a greatly important role in the implementation of the standards.

In the view of the modern finance and accounting, many a method suggested by standard-makers is effective in the prerequisite of judgments. Besides, under the structure of existing system, more and more methods of accounting treatments can be chose, many problems depend on accountants' estimation and judgments, moreover, improbably proceeds and risks leave extensive space for accountants' professional judgments (Wang Shiguo, 2006).

No doubt, the space of accountants' professional judgments firstly is decided by the elasticity of standards, but the elaborate regulation and guide are also very necessary. The new accounting standards add some specific ones, such as Biological assets, Employee compensation, Impairment of assets, Enterprise annuity fund, Share-based payment, Government grant, Income tax, foreign currency, Recognition and measurement of financial instruments, Transfer of financial assets, Hedging, Extraction of petroleum and natural gas etc, which fill up the blanks of accounting standards. However, at the same time, with the increase of difficulty coefficient of accounting technique and the enlargement of free discretion, how to choose a suitable accounting policy, a method of provision for depreciation and inventory price, and how to confirm the present expense and make the measurement of assets more efficient as well as profits more realistic, are all dependent on accountants' professional judgments.

The four newly-born standards of financial instruments completely converge with IFRS, adapting to the developing tend of increasingly complicated financial instruments and transactions, but the accounting calculation of financial instruments are greatly challenged, as they will need more accountants' professional judgments. The IAS is mainly oriented by principles, resulting in more dependent on judgments than the criteria-orientation. Secondly, large numbers of matters call for accountants' professional judgments as the rules in the IAS are of great complication. Thirdly, when the trading in the market is not active, lacking market price, accountants have to confirm the fair value by other information and appraisal technology, which is a higher requirement for accountants' judgments.

Fair value, more or less, embodies in 17 specific accounting standards such as Financial instruments, Investment properties, Enterprise incorporation under non-common control, Debt restructuring, Non-monetary assets etc. It becomes a highlight in the accounting standards. In particular, it seems more important for financial derivatives, because the initial net investments are scarcely or less necessary, in other words, the historical cost appears powerless. Fair value is different from other measurement attributes, as it only works in the environment where current transaction prices exist. However, this character requires accountants to improve their professional judgments and avoid manipulating profits by this tool. As far as we concerned, accountants' professional judgments play an important role in the standards, so whether the new standards can reach the anticipated targets and effects is



decided by judgments to a large extent. Above all, accountants' professional judgments are the essence of Chinese accounting standards.

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# Technology Strategy and Firm's Revenue Growth: Empirical Evidence of Malaysian Industrial Automation Industry

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## **Abstract**

Technology strategy was found by many researchers as a way to improve competitiveness. Failure to develop and integrate technology strategy and business strategy is a major contributing factor to the decline of firm's competitiveness. Many literatures also indicated that technology strategy played an important role in determining firm performance in technology-driven industries such as industrial automation company. However, most of the previous studies have generally focused on the structure-conduct-performance theory which emphasized greatly on external factors (i.e market condition and competitors) to link strategies to firm performance. Very few studies were found to link strategies with the internal factors. Thus, the present study was undertaken to relate strategic view and resource-base view theory to the firm performance of industrial automation company looking at technology selection, technology competence, technology posture and the moderating effect of the resource deployment. The empirical result based on 61 Malaysian industrial automation company found that, technology selection has positive impact towards revenue growth (measuring firm's performance). However, technology posture was found to be a negative predictor towards revenue growth and technology competence has no significant impact on revenue growth. Resource deployment on the other hand was identified to only moderate technology selection and technology posture but not technology competence.

**Keywords:** Technology Strategy, Industrial Automation, Resource Base View

## **1. Introduction**

Since the Industrial Revolution, many production technologies had been introduced and evolved to improve the production efficiency and reducing the production costs. Industrial automation is one of the widely used strategies by the manufacturers to improve their competitiveness, in terms of quality and operating cost. The concept of industrial automation is widely used by manufacturers in automobile, electronic and electrical, chemicals and steel industries, for a better plant efficiency or a lower unit cost of production. Countries like USA, Europe and Japan adopted automation strategy to improve their competitiveness, in terms of cost, quality, flexibility, and delivery (Hayes & Jaykumar, 1988; Goldhar & Jelinek, 1985; Parthasarthy & Sethi, 1992).

In Malaysia, manufacturing sector has been one of the most important economic contributors. The sector grew rapidly since during 1999. As per year 2007, the manufacturing sector generated 30.3% of Malaysia Gross Domestic Product (GDP). Manufacturing sectors are expected to be the main drivers of the economic growth, which is anticipated to expand at 6.5% each year. In addition, the introduction of the third Industrial Master Plan (IMP3) for the periods of 2005-2020, will accelerate the pace of development and linkages between manufacturing-related services and enhance the development of industrial clusters. Ultimately, it will help enhancing the competitiveness of the manufacturing sectors and the industry clusters. However, the empirical studies related to the factors that affect the success especially of an automation firm is still scanty and need further research. Therefore, this study

intends to assess the factors that influence the performance of Malaysian automation firms looking at the perspective of resource base view theory.

## **2. Literature Review**

A number of researchers (e.g. Maidique & Patch, 1978; Burgelman & Rosenbloom, 1989; Stacey & Ashton, 1990; Spital & Bickford, 1992; Herman, 1998; Cooper, 2000) have studied a few factors that contribute to the success of firms in the industrial automation sector. Of particular importance is technology strategy, which represents the pattern of decisions, the position relative to competitors and the perspective from which management makes decisions regarding technological activities, equipment, materials and knowledge (Herman, 1998). Schilling and Hill (1998) note that the purpose of technology strategy is to identify, develop, and nurture those technologies that will be crucial for the firm's long run competitive position.

One of the earliest concepts of technology strategy was provided by Maidique and Patch (1978). They conceptualize technology strategy based on three dimensions, namely (1) type of technology; (2) level of competence; (3) timing of technology introductions; (4) level of investment; (5) organization and policies, and (6) source of technology. Type of technology or technology selection is associated to the distinctiveness and the value of technologies that the firm specializes in. Level of competence refers to how specialize the firm is in its technologies. Timing of technology introduction equates to introducing a technology ahead of competitors. Level of investment is related to financial resource allocations whereas organization and policies are associated with implementation of strategy (Spital & Bickford, 1992). Source of technology on the other hand refers to mode of technology acquisition, whether it is internal R&D, external R&D or others. These are methods or ways to pursuing technology strategies. The last three dimensions (level of investment, organization and policies, and source of technology) are greatly allied to technology management processes, which are to be distinguished from technology strategy content for further evaluation of their contribution as a source of competitive advantage (Herman, 1998).

There is substantial amount of research regarding the linkage between technology strategy and firm performance, which mostly focus on new product development. Cooper and Kleinschmidt (1996) have found high correlation between new product or technology strategy and firm performance. Similarly, Zahra and Covin (1993) have found a clear correlation between business strategy-technology strategy fit and firm performance. This supports most research findings that, organizations who know how to link their technology strategy with their business strategy will be more competitive in the global marketplace (Roberts, 2001; Mitchell, 1992; Frohman, 1982; Spital & Bickford, 1992; Herman, 1998).

A good technology strategy will never achieve success without effective resource deployment in embracing the strategy. Numerous literatures emphasize the important role of resources in determining performance of technology intensive industries. Cooper and Kleinschmidt (1996) found that adequate allocation of resources of people and money is one of the critical drivers of superior performance. Based on earlier works, Cooper (2000) further elaborates the point that having the right resources and sufficient resources in the right projects is one of the important cornerstones of high-performing businesses. Hofer and Schendel (1978) argue that the deployment of firm-specific resources is central to strategy and performance. Norton (1998) argues that resource allocation should offer evidence of strategic significance. If a firm differentially commits resources, that commitment suggests a relative emphasis. It is this relative emphasis that underlies the strategic significance.

## **3. Theoretical Framework and Methodology**

Researches suggest that firm's technology strategy such as technology selection, technology competence and technology posture, can effect company's revenue growth (e.g. Maidique and Patch, 1978; Cooper, 2000 Herman, 1998, Zahra & Covin, 1993). In addition, revenue growth can be enhanced by internally deploying resource namely financial, human and physical resources.

The proposed conceptual model is based on the premise that industrial automation industry, as a technology-based industry, competes primarily on technology. Consequently, technology is a competitive weapon to be used to gain market share and corporate growth (Schilling, 1998; David, 1998; Mitchell, 2000). A well-formulated technology strategy draws a direction for the firm towards technological and business competitive advantage against other competitors (Cooper & Kleinschmidt, 1996; Schilling & Hill, 1998; Khalil, 2000), which leads to the success of the automation firm. Therefore, technology strategy is proposed as the primary independent factor that affects revenue growth of a company.

However, technology strategy must be implemented with proper resource deployment (Cooper & Kleinschmidt, 1996; Cooper, 2000; Khalil, 2000). A well-formulated technology strategy, if deployed with proper resources, will have tactical advantage in achieving success. The proper resources provide the basis for a firm's sustainable advantage (Barney, 1991; Leonard-Barton, 1992; Godfrey & Hill, 1995). Contrarily, a well-formulated technology

strategy, if deployed with improper resources, will not lead to the desired performance. This suggests the moderating characteristics of resource deployment.

The unit of analysis for this research is Malaysian-owned automation firm, defined as a company that is locally incorporated and has at least 51% Malaysian equity. The information was collected via survey questionnaire obtained from Penang Development Center (PDC), Federation of Malaysian Manufacturers (FMM) and Small and Medium Industries Development Corporation (SMIDEC). All of the questions were asked based on six-point Likert scales. For technology selection, this research adapted the characteristics of core competencies of the technology owned by the company, proposed by Prahalad and Hamel (1990); For technology competence, the measures was developed based on Quinn's four levels of intellect (1996); For technology posture, the instruments was adapt from Conant et al. (1990) on the dimensions associated with strategy typology and the dimensions of resource deployment was from Cooper and Kleinschmidt (1996).

#### 4. Research Hypotheses

##### 4.1 Technology Strategy

This research draws upon prior researches by Maidique and Patch (1978) to develop a set of key dimensions of technology strategy. Technology strategy is conceptualized in this study through the use of three dimensions: (1) technology selection, (2) technology competence, and (3) technology posture.

*Technology selection* refers to the distinctiveness and the value of the core technologies that the firm develops. Maidique and Patch (1978) state that, the selection of the technology or technologies in which the firm will specialize in, is of paramount importance for a technology intensive firm. Core technologies provide the technological basis for differentiation. Relative strength in core technologies, and the ability to sustain proprietary advantage in these technologies, is critical to successful competition (Burgelman & Rosenbloom, 1989). Firms that possess high value-added core technologies will have competitive advantage over its competitors. Thus, it is hypothesized that,

**Hypothesis 1:** *Firms that develop high-value core technologies will perform better than firms that do not possess high-value core technologies.*

*Technology competence* refers to the sophistication of the technology employed by the firm relative to the state of the art (Maidique & Patch, 1978; Herman, 1998). It measures the level of competence or specialization of a firm in its technologies. Quinn (1996) proposes that these intellect can operate at four levels: know-what, know-how, know-why, and care-why. Know-what or cognitive knowledge is the basic mastery of the discipline. Know-how or advanced skill is the translation of book learning into effective execution. Know-why or system understanding is knowledge of the cause-and-effect relationship underlying a discipline. Care-why or self-motivated creativity is the will, motivation, and adaptability needed for success. These collective sets of knowledge and skills form the roots of firm's core competencies, which determine the company's competitiveness (Prahalad & Hamel, 1990). It is hypothesized that:

**Hypothesis 2:** *Firms with strong technology competence will perform better than firms without strong technology competence.*

*Technology posture* refers to a firm's propensity to proactively use technology as a competitive weapon and as a key positioning factor (Zahra & Covin, 1993). The posture can be a technology leader, a follower, or a laggard (low cost) (Ansoff & Stewart, 1967; Maidique & Patch, 1978). Firms that lead and innovative in technology gain "first mover" advantages against its competitors. Since technology leader enters new product market before other competitors do, the leader has the advantage to capture a larger market share. Leaders can also protect their technology through patents and other means to prevent late entrants from competing, giving those better opportunities to fully exploit their technology. Since technology leaders establish a technology gap between their products and their customers or competitors, they are able to reap abnormal profits by charging a high price for their products (Khalil, 2000). Therefore it is hypothesized that.

**Hypothesis 3:** *Firms with strong technology leadership will perform better than firms without strong technology leadership.*

##### 4.2 Resource Deployment

*Financial resource deployment* refers to the allocation and the utilization of funds and capital resources. The importance of financial resources in high technology industries has been noted by prior researchers (Maidique & Patch, 1978; Burgelman & Rosenbloom, 1989; Cooper & Kleinschmidt, 1996). Empirical studies show that R&D spending correlates strongly with the success of R&D programs, annual sales growth rate and profitability (Frohman, 1985; Maidique & Patch, 1978; Maidique & Hayes, 1984; Mansfield, 1981; Cooper & Kleinschmidt, 1996). Without sufficient funding, it is difficult to enable an automation firm to develop its core technologies, specialize in

its fields, come up with innovative products, and position itself in the technology leading edge. Technology strategies need to be implemented before it can bring about the desired performance. In a technology-intensive industry sufficient financial resources must be made available. Hence, it is hypothesized that

**Hypothesis 4:** *Deployment of sufficient financial resources will enhance the impact of technology strategy on revenue growth.*

#### 4.3 Firm Revenue Growth

Herman (1998) stated that growth rate is an important performance indicator that reflects the effect of technological decisions. Revenue growth furthermore is less susceptible to financial manipulation than some other measures (Michalisin, 1996; Herman, 1998). Therefore Revenue growth is the dependent variable.

### 5. Research Findings

#### 5.1 Descriptive Analysis

There are more than 80 companies in industrial automation industry. However, a total of 61 questionnaire responses received and were usable. Out of these, 77 percent are fully Malaysian-owned. The remaining 23 percent are joint ventures with more than 51 percent equity being held by Malaysian. Most of the firms (47.5%) have been in this industry between 5 to 10 years. There are 8.2% of firms with less than 5 operation years in this industry, indicating that the number of new entrants is not high. Interestingly, there are only 6.6% of firms that have been operating in this industry for more than 20 years. This may be because Malaysia is still young in manufacturing field.

The result from table 1 shows that majority of the firms perceived their selected technology as high to medium value, with beyond medium level of technology competence and in high to medium level of technology posture. Apparently none of the respondents perceived themselves as low in technology selection, technology competence, and technology posture. For financial resources deployment, majority of the firms perceived their resource deployments are high.

Table 1. Descriptive statistics of major variables

Dimension	Mean	Std. Deviation
Technology Selection, x1	4.3279	0.9742
Technology Competence, x2	4.9959	0.6689
Technology Posture, x3	4.5123	0.7366
Financial resources deployment, z1	4.0710	1.0401
Revenue Growth, y	28.45%	43.88%

Notes: scale range: 1(low) to 6 (high)

The information about revenue growth is obtained from respective firm's annual reports. The sample mean for revenue growth is 28.45% with the standard deviation of 43.88%. Most of the firms (32.8%) achieved the revenue growth rate in between 0% to 25%. This is followed by 18% of the firms that recorded the revenue growth rate in between 25% to 50%.

#### 5.2 Test of Relationship

##### Hypotheses Testing

Table 3 indicates the model summary of the hierarchical regression analysis.  $R^2$  results show that the relationships exist between the variables. F-statistics for revenue growth indicating that the model exists and F value was large enough to accept alternate hypotheses and reject null hypothesis.

Table 2. Results for hierarchical regression

	Model 1 (control variable)	Model2 (independent variables)	Model3 (moderating variable)	Model4 (Interaction variables)
F value	1.559	2.589**	2.216**	2.293**
R square	0.115	0.287	0.287	0.381
R square change	0.115	0.172	0.000	0.094
F change	1.559	3.622**	0.003	2.068

\*significant at the 0.1 level; \*\* significant at 0.05; \*\*\*significant at 0.01

Table 3. Standardized beta coefficients

INDEPENDENT VARIABLES	DEPENDENT VARIABLE			
	REVENUE GROWTH			
	Model1	Model2	Model3	Model4
<b>Control variables</b>				
Years of operations	-0.352**	-0.340**	-0.340**	-0.311**
Company size	0.318*	0.375**	0.375**	0.469***
Joint venture ownership	0.055	0.099	0.098	-0.019
Joint venture R&D	-0.065	0.114	0.114	0.141
<b>Model variables:</b>				
Technology selection, x1		0.671***	0.672***	3.768***
Technology competence, x2		0.319*	0.279	0.200
Technology posture, x3		-0.874***	-0.868***	-0.3997***
<b>Moderating variable</b>				
Financial Resources Deployment			-0.010	-1.905*
<b>Interaction variable</b>				
Tec. Selection*FRD				-5.518**
Tec. Competence*FRD				0.496
Tec. Posture*FRD				7.070***

\*significant at the 0.1 level; \*\* significant at 0.05; \*\*\*significant at 0.01

Table 4 shows the significance test results of the regression analysis for testing Hypotheses 1, 2 and 3. Company years of operation and its size have significant impact on revenue growth. Both technology selection and technology competence have significant positive relationship with revenue growth at 5% and 1% level respectively. Technology posture on the other hand has significant negative relation on revenue growth only at 10% significance level. the magnitude of the standardized coefficient of these independent variables indicates that technology posture has the strongest impact on revenue growth.

In testing Hypotheses 4, the results show that financial resources deployment has a pure moderating effect on technology strategy-revenue growth relationship. It was found that only the interactions between technology selection and technology posture with financial resources deployment are significant. Thus, financial resources deployment moderates the relationship between technology selection and technology posture with respect to revenue growth.

Figure 2. Moderating effects of financial resources deployment

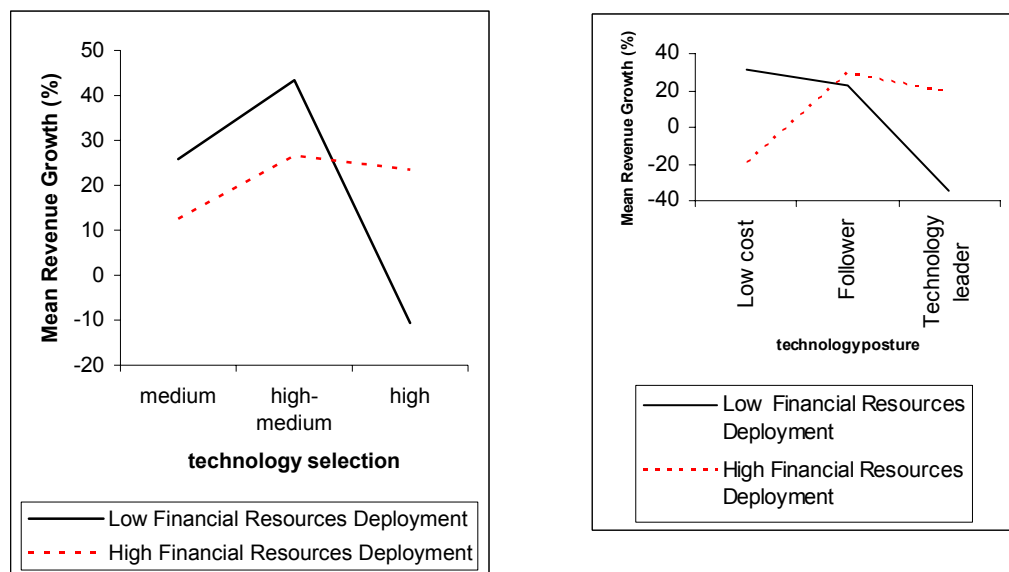


Figure 2 above was plotted to further elaborate on the moderating effect from financial resources deployment. It is observed that when financial resources deployment is high, the impact of technology selection on revenue growth is positive when the level of technology selection is medium to high-medium, and become negligible when the level goes beyond the high-medium. This suggests that in situation that high financial resources can be made available, there is a limit on the positive impact of technology selection on revenue growth. On the other hand, when the financial resources that can be readily deployed is low, the impact is positive when technology selection is medium to medium-high, and negative beyond medium-high level. Assessing the moderating effect of financial resources deployment on technology posture, it is observed that if financial resources deployment is high, there is high positive impact of technology posture on revenue growth rate from low-cost posture to follow-the-leader posture. However, the impact becomes negative once the posture moves towards being a technology leader. On the other hand, when financial resources deployment is low, the impact of technology posture on revenue growth is generally negative, with the impact being slightly negative when the posture is from low cost to follower, but the revenue decline is seriously jeopardize when the company assumes a technology leader posture.

## 6. Conclusion and Discussion

### 6.1 Technology Strategies Adopted by Malaysian Automation Firms

The result shows that technology selection was perceived as high to medium level, meaning that most of the industrial automation firms understand the importance of providing value-added technology to customers. However, the automation technologies of most firms are not too difficult to be imitated. Thus, the average value score of technology selection is in between medium to high. For technology competence, it was beyond medium level. This is not surprising as industrial automation is a technology-intensive industry. Furthermore, industrial automation firms must be technologically competent to provide stable and reliable machines for customers; else customers will switch to other competent rivals since unstable and unreliable machines have high down time and add costs of production to the customers. Technology posture also shows high-medium scale; indicating that they follow the-leader posture.

Table 5. Average return-on-sales of the firms by technology posture

Technology Posture	Laggard	Follower	Leader
ROS (%)	3.23	14.81	-5.45

Table 5 above shows a most probable reason for this. It is observed that followers have an appealing average Return on Sale (ROS) than other postures. Technology leaders, due to their high costs associated with R&D and testing, on average run into losses. Followers on the other hand learn from leaders' mistakes and weaknesses. They then imitate and improve leaders' design or technology with lower initial investment in R&D and higher chances of success. Thus, they are able to achieve better net profit margin. On the other hand, technology laggards do not have technological advantage and therefore have to adopt low cost strategy to compete with others. They under price the competition in the market place to gain market share, by sacrificing their net profit margin. Hence, their ROS is lower than followers.

It is also observed that financial resource deployment has significant positive correlations with technology strategies. That also explains the rationale of adopting certain technology strategy. Firms that have insufficient resources will find themselves hard to establish high value core technologies. They typically also lagged in technologies and find difficulties to develop high technology competence. Hence, these are normally the firms that adopt lower value of technology selection, lower technology competence together with low cost strategy.

### 6.2 Impact of Technology Strategy on Revenue Growth

*Technology selection* has positive impact on revenue growth. In other words, the higher the value of selected technology, the higher its revenue growth. High-value technologies can help the customers to create products with significant cost and value advantages. The value of technology selection shapes the roots of competitiveness for an automation firm. If these high-value technologies are difficult for competitors to imitate, it will form the core technologies that provide distinctive advantage to the firms. If a firm can sustain proprietary advantage in its high-value core technologies, it will continuously outperform its competitors and experience high revenue growth. This supports the literatures which state that core technology is a fundamental concept in the formulation of a technology strategy, which is critical to build the inner strength of a strategy (Khalil, 2000). Also the findings are consistent with the literature that says; company's core technology determines its competitiveness (Prahalad & Hamel, 1990; Burgelman & Rosenbloom, 1989).

*Technology competence* also has significant positive impact on revenue growth, suggesting that the more technologically competent automation firm is likely to enjoy higher revenue growth. Technology competencies in the forms of “know-what”, “know-how”, “know-why”, and “care-why” (Quinn, 1996) help shape the critical capabilities that form the building blocks of technical competencies. As business environment is dynamic and competition is so intense, customers are under pressure to reduce new product’s time-to-market with maximum volume ramping flexibility and product manufacturability. Hence, customers expect automation firms are able to advise them on product and process design issues, and improving their current processes in terms of yield, throughput, efficiency and quality. This supports the literatures which state that competency enables companies know how to do uniquely well and that provide them with a better-than-average degree of success over the long term (Gallon, Stillman, & Coates, 1995). Dierickx and Cool (1989) also stated that technical knowledge is a basis for competitive advantage, and thus should be related to performance. Similarly, Ansoff (1984) stated that strength in product technologies is essential to economic success under conditions of product technology dynamism.

Of the three elements of technology strategy, technology competence has the least relative impact on revenue growth compared to technology selection and technology posture. This suggests that technology competence may not be a unique competitive advantage to industrial automation firms, as firms are similar (as indicated by the smaller standard deviation values for this variable; see Table 1). This implies that technology competence is already a market expectation or what is usually referred to as competition qualifier. Hence, technology competence may not be a strong base for differentiation as technology selection and technology posture.

The results also indicate that *technology posture* has negative impact on revenue growth. In other words, a Malaysian automation firm that positions itself as a cost leader will grow faster than as a technology leader. This is not surprising as their customers are under a lot of cost pressures from intense global competitions. These cost pressures are partly translated to lower capital investments. Hence, automation firms that adopted low cost strategy will benefit the most from customer’s production capacity expansions and thus enjoy high revenue growth. The findings are consistent with the literatures which argue that as product technology matures (which is quite true for automation technology) and superior designs are copied, the difference in product performance narrows and products become more standardized. Under these circumstances, price becomes a more important basis of competition. Under such a price-competitive environment, cost leadership is associated with success (Utterback & Abernathy, 1975; Abernathy & Utterback, 1978; Tushman & Moore, 1982).

### 6.3 Moderating Effects from Financial Resources Deployment

The result also showed that automation firms that choose to develop high value technology can only be successful if they deploy sufficient financial resources for their R&D programs. In fact, substantial empirical research has indicated that investment R&D is positively related to technical output (Frohman, 1985; Mansfield, 1981). Consistent investment in R&D is also related to generating positive results (Maidique & Hayes, 1984). The differential impact of technology strategy on revenue growth is evident only for technology selection and posture. In the event that there is high allocation for financial resources to implement the technology selection, the positive impact of technology selection is only valid for medium to high-medium levels of technology selection. In the context of low financial allocation, technology selection jeopardizes revenue growth when technology is excessive.

In addition, if financial resources deployment is low, there is high negative impact of technology selection on revenue growth rate from high-medium- to high-value technology selection. Again, low level of financial funds cannot support high-value technology development effectively. However, this also implies that under insufficiency of financial resources a Malaysian automation firm should focus on high-medium level of technology values. There is a better strategic fit to focus on high-medium value technology selection, as it does not require very high investments for effective strategy adoptions.

Similarly technology posture needs to account for the financial resources allocation, if an automation firm is to benefit in terms of revenue growth. Automation firms with high financial resources benefits (in terms of revenue growth) only when they move from a low cost to a follower posture. In fact, taking a technology leader posture for such firm will be detrimental to their revenue growth. This is supported by literatures that innovating differentiators produce new products and technologies with strong emphasis on R&D (Miles & Snow, 1978; Miller & Friesen, 1984; Lawless & Finch, 1989).

It is also clear that firms with low financial resources cannot hope to improve their revenue growth through technology posture. The least impact for such firm would be to adopt a low cost or a follower posture. This is because low level of financial funds cannot support intensive technology development that leaders need to operate. However, this also implies that under insufficiency of financial resources, follower strategy is still possible since it



does not require such an extensive investment as leaders need. Coupled with cost advantage over the technology leaders, followers are able to capture higher revenue growth particularly in this price-sensitive marketplace.

#### 6.4 Implications and limitation of the study

Firms that currently focus on low value technologies must upgrade their technologies to higher value chain. Low-end technology is easily duplicated by others and the only market strategy to compete is low cost. This leads to a price competition and erodes firm's revenue.

Technology competence is a basic customer expectation nowadays. Firms that do not have good technical competence will eventually be knocked out from the business. However, technology competence is not a good basis for differentiation. It is just a qualification needed in today marketplace. Proper training and development should be provided continually to maintain high technology competency. Malaysian automation firms should also try to recruit and retain those talented designers and engineers. Government should also co-organize skill development programs with privates to help develop local technology competency.

Follow-the-leader is still the most attractive strategy. It associates with fewer costs and lesser risks, as well as high ROS. Malaysian automation firms should try to keep close attention to the latest technology, especially those leaders' pace. Technology leaders should revise its R&D programs carefully in terms of risks and costs. This is to avoid major failures that will erode the firm's profitability. It is important to clarify that technology leader strategy does not mean worse than the follower strategy. Technology leaders still have a lot of "first-mover advantages", but their R&D directions must be carefully managed and deployed with right resources. Technology laggards have to move themselves up towards followers. This does not mean that they should abandon their low cost advantage. They still can keep their cost structure low as one way of segment invasion strategy.

This study however, limits its focus to the effects of technology strategy and resources deployment on revenue growth. In doing so, a number of other factors that may affect firm's revenue are omitted, e.g., marketing strategy, financial structure, culture, people innovation etc. Scope of the study was also limited to the northern part of Malaysia thus, the results may be skewed towards the northern situations and may not be generalizable to overall Malaysian industrial automation.

#### 7. Conclusion and Recommendation for Future Research

There is very limited literature on industrial automation industry in Malaysia and abroad. This research offers only a small insight into how the firm performance in this industry is being affected by technology strategies. Industrial automation will continue to be one of the important clusters under IMP to further develop our manufacturing sector towards higher value chain. Appropriately, a few suggestions are provided below for future research.

For future research it is suggested that the scope of study should be extended to include marketing strategies and business strategies on the tactical side. Ultimately, technology strategy must break down to action and be implemented with integration of marketing strategies and business strategies. Future research should also look at the operations strategies that affect ROS, as profit is still crucial to an organization.

This research was primarily set to seek some answers to how technology strategy impacts the performance of Malaysian automation firm, which was measured in terms of revenue growth. The impact of technology selection, technology competence, and technology posture was studied. The resource deployment was thought to moderate the relationship across three dimensions; financial resources deployment, human resources deployment, and physical resources deployment.

Base on this study of 61 local automation firms, it is found that technology selection has positive impact on revenue growth at 5% significance level while technology competence has positive impact on revenue growth at 10% significance level. However, technology posture is found negatively relate to revenue growth at 5% significance level. Only financial resources deployment moderates on technology selection and technology posture.

These findings have rendered more understanding on industrial automation industry as how to achieve high growth in this industry. Overall, Malaysian industrial automation still has long way to go to navigate Malaysia's manufacturing industry towards an advanced level. R&D is the engine of this cruise. Technology strategy is the rudder of the cruise.

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# Building Competitive Advantage of Locations for Automobile Industry: Changchun as the Example

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## Abstract

A location must establish its own competitive advantages to meet the demand of global economy age, therefore, first, this paper brings forward the definition of competitive advantage of locations. Second, China is changing from industrial society to knowledge society, so the competitive advantage of locations for Chinese industries have the cross-characteristics of the two societies, which is globally representative. On the base of the deep influences of Transnational Corporations on automobile industry, the paper analyzes the competitive advantage of locations for automobile industry and points out the index system of that. Finally, it takes Changchun, in which there is the largest automobile enterprise *FAW* (First Automobile Works) in China, as the example to give out the way how to establish competitive advantages of locations.

**Keywords:** Automobile industry, Competitive advantage of locations, Changchun

In the global economy age, Transnational Corporations (TNCs) become the main economic subjects of the global economic action, so the location conditions are the key to attract the investment of TNCs. This paper considers that keeping and attracting industrial resources has been in the period of global competition for locations, and locations have to establish their own competitive advantages like nations. Locations should establish a new mechanism to improve and develop all kinds of conditions, to make them to promote and cooperate with each other, and enhance the integrated strength. Therefore, the paper brings forward a definition of competitive advantages of locations, which means the integrated strength of locations to attract and keep industrial resources in the global economy times. Locations should confine the contents of their competitive advantages according to their own industrial characteristics and conditions of external connection, and then bring forward the routes and approaches to establishing advantages.

## 1. The model of competitive advantage of location

### 1.1 The enlightenment of Porter's theory of competitive advantage

Michael Porter (2003) pointed out that locations can influence the competitiveness and the model of resources of local competitive advantage (see Figure 1). Therefore, the competitive advantage of location comes from the integrated and concerted development of four interlinked factors which are firm strategy, structure and rivalry, demand conditions, factor conditions and related and supporting industries, which have their own systems and are closely interconnected.

### 1.2 The enlightenments of the global location theory and the theory of industrial clusters

Locations can not have all the related and supporting industries because of local relative scarce resources, so they must build their connection systems. The point of the global location theory is that cities should manage to become a convenient network node in the multi-polar and multi-level world system of cities and strengthen their industrial attraction (Guo, Rong chao, 2004). Therefore, locations need integrate their inside and outside by building sound connection networks, and win initiative in the location competition. The researches of clusters show that local

capability to absorb knowledge and innovate makes the local advantage industries in long-term flourish. Paul M. Romer(1986, 1990) brought forward that knowledge was the new dynamic resource of economic growth, emphasized that innovation was the non-competitive knowledge which could be accumulated constantly, and redefined the basic input of product as material capital, knowledge of innovation and human resources.

### *1.3 Building the model of competitive advantage of locations*

This paper considers that Porter has brought forward the main contents of competitive advantage of location, but his model is not complete. Whereas local resources are scarce, the external connection is not only a means but an important part of competitive advantage of locations. Therefore, competitive advantage of location is completed. And the researches of clusters show that the capability to absorb knowledge and innovate has become the core capability for sustainable development of local industries.

So this paper brings forward the model of competitive advantage of location composed of two parts, the internal one of which is a diamond model composed of five interlinked factors that are firm strategy, structure and competition, factor conditions, demand conditions and related and supporting industries with the capability to absorb knowledge and innovate as the core, and the external one of which is building convenient material connections and information ones with the important locations in each regional level(see Figure 2).

The internal part is the intrinsic factors of competitiveness advantage of locations, and the external connection is the assistant power. Location should build a good industrial environment to drive the development of external connection, and the external connection can make up the resource scarcity of the location. It should connect with important locations in all regional level, centralize the outside floating factors by building itself, help the location to complete the internal diamond model, and increase its core capability.

## **2. The index system of competitive advantage of locations for automobile industry**

The meanings of location advantage is different in different societies(see Table 1, Zhang Yun, 2001; Wang Xing ping, 2005), and China is changing from industry society to knowledge society, so the contents of the location advantage for manufactures must have the crossover characteristics of the two societies. In the manufactures, Transnational Corporations (TNCs) have great influence upon China's automobile industry, and they will perform inestimable functions, therefore, locations will compete more and more drastically for global resources of the automobile industry. Undoubtedly, building competitive advantage of location for the automobile industry is important for each location with the automobile industry, so the paper takes the automobile industry as the example to discuss the competitive advantage of a certain industry.

The paper adjusts Porter's model and ascertains the content of the model of competitive advantage of location for the automobile industry according to the characteristics of the TNCs' locations and the index of the relative studies on the automobile industry. Most of the TNCs' locations have the same characteristics which are fast international transportation, near international airports, abundant high-quality specific human resources, complete communication and information net, near the administrative centers and the convergence locations of commercial institutions(Guan, Chi ming et al., 2003). The index of Chen, Qing tai et al.(2004) are the automobile industrial foundation, local consumers, enterprises and enterprisers, location conditions, the industrial historic achievements, the strength of TNCs, the degree of marketization, and the degree of innovation of state-owned corporations. According the above analysis and the characteristics of the automobile industry, the paper points out the indices of competitive advantage of the automobile industry (see Table 2).

## **3. Building Changchun's competitive advantage for its automobile industry**

Some Chinese experts pointed out that there will be three locations with international competitive advantage of automobile industry, which are Changchun, Shanghai and Guangzhou(Chen, Qing tai, et al.,2004). Changchun is an important city for China's automobile industry, and also it is one of the central cities in the Northeast old industrial bases, but it is more difficult for Changchun to develop the clusters with international competitive advantage than for the other two cities (see table 3). So it is very important for Changchun to find the train of thoughts to enhance Changchun's competitive advantage for its automobile industry, and it can be used for reference to other locations with correspondingly worse conditions.

### *3.1 The condition analysis of Changchun's competitive advantage for its automobile industry*

Changchun has only two excellent indices in the above compare with Shanghai and Guangzhou(see Table 3), which shows that Changchun's comprehensive strengths is much worse than the other two cities. In addition, the strengths of Changchun's relative industries and local suppliers are weak because there are only three enterprises in the list of nationwide 100 top suppliers in 2004.

However, Changchun still has other advantages. First, it has the advantage of comprehensive environment resources

because it is ranked the 1st in the 200 Chinese cities with comprehensive environment resources(Ni, Peng fei, 2005). And it is ranked the 2nd with the water conservancy, environment, public property management industry, the 5th with the culture, sports and recreation industry, and the 9th with education industry in the 47 cities in the analysis of Chinese clusters competitiveness(Ni, Peng fei, 2005). Second, Changchun has strong R&D ability. It is ranked the 10th with the science-technological competitiveness, the 4th with the transformation ability of the science-technology, and the 11th with the structure competitiveness in the 200 Chinese cities, and the 8th with the service industry of R&D and geologic prospecting industry in the 47 cities(Ni, Peng fei, 2005). Also, a group of strong enterprises, colleges and R&D institutes establish the base of Changchun's innovation ability.

According to the above analysis on the location for Changchun's automobile industry, the paper brings forward two principles of building Changchun's competitive advantage for the automobile industry. One is promoting the R&D advantage by building the international R&D network with Changchun as the core and developing the capability to both self-R&D and cooperative R&D. The other is developing the disadvantages, the little information of local consumers and the weak relative industries and local suppliers, by building the regional clusters and nationwide information network.

### *3.2 Enhance the R&D capability of Changchun's automobile industry*

On the one hand, Changchun should build good *Internal* R&D model, flowing the international technological trend and giving prominence to the state-brand strategy (see Figure 3). In the model, the enterprises, R&D institutes, colleges and the institutes of enterprises cooperate and form the core strength of self-R&D. Demand should be guided by the market and follow the international trend such as protecting environment, saving energy resources, developing new energy resources and new materials. The nation brands are the carrier of the corporate strategy. Capital from government comes from direct investment and indirect investment, the former of which is usually allowance or procurement, and the latter is helping small and medium-sized enterprises by all kinds of policies. Corporations should cooperate extensively and absorb the corporations of the relative industries into the group for self-R&D to combine technology and application and shorten research time, for example, the cooperation of Anshan Iron Group, which is the largest Iron Group in Northeast China, and First Automobile Works (FAW), which is the core of Changchun's automobile industry, must influence deeply the self-R&D ability. Therefore, R&D can drive the division and cooperation of Changchun's corporations, and finally drive the technology development of Changchun's automobile industry.

On the other hand, Changchun should increase the cooperation of important domestic and foreign enterprises and research institutes, and construct an international network of R&D. First, Changchun builds the cooperation network by establishing bilateral and multi-party organizations considering the characteristics of different regions and their different development emphasis of automobile industry and the supporting ones. The paper suggests Changchun to combine the R&D institutes of Harbin and Dalian in Northeast China, and the strong R&D institutes and colleges of Shanghai, Beijing, Guangzhou and Wuhan in other domestic regions. The ways to build cooperation organizations should differ in forms and styles, for example, in the December of 2004, Hongkong and Changchun signed a framework agreement to construct Changchun-Hongkong center for accelerating productivity, and the first cooperate object is building Changchun-Hongkong base for R&D and production. Second, Changchun's corporations should walk out and fetch in positively, build the sub-centers in the appropriate locations of FAW with Changchun as the core, cooperate with the R&D institutes of domestic important corporations and foreign ones, and fetch in the domestic and international R&D institutes to upgrade Changchun's R&D strength continuously.

### *3.3 Build the regional cluster of automobile industry and the national transportation network and information network*

First, Changchun should concentrate on build the Northeast cluster of automobile industry. Changchun should strengthen the industry affiliations with Shenyang, Harbin and Dalian by building the industry alliances. And as the production center, Changchun will establish an industrial corridor with Shenyang, Dalian and Harbin as the production bases for automobile components. Moreover, Changchun should cultivate some trans-regional large enterprise groups with the enterprises of automobile industry and the supporting ones by the strategy of enterprise alliance. At the same time, Changchun should build the Northeast transportation network with Shenyang and Dalian as the centers, which have better foreign transportation connection, and Changchun and Harbin as the sub-centers. So Changchun will build the regional industrial cluster on the base of the automobile industry and the supporting industry of the Northeast China.

Second, Changchun should build the nationwide network for production and transportation. By the networks for production and purchase of the core enterprises such as FAW (First Automobile Works), Changchun should set up the nationwide production network with Yangtze River Delta, Pearl River Delta, Central China, Beijing-Tianjin area

and Southwest China where there have appeared automobile clusters. And the coastal areas with Shanghai, Guangzhou, Beijing and Tianjin as the centers are the main development directions. Changchun should set up the modern stereoscopic transportation network platform and the network platform of logistic information, and establish trans-regional modern logic enterprise groups by cultivating third-party logistics, spreading the networks with the addition of important cities in the above regions as the nodes.

Third, Changchun should establish a nationwide information network. On the one hand, Changchun can promote the ability of propaganda. For example, the government, large enterprises and automobile associations should hold meetings of product show and sales, publicizing the information by media, websites and inviting domestic and overseas enterprises. The automobile culture should be built, and the first step can be considered as visiting the modern enterprises of FAW. The government and automobile associations can organize enterprises to attend the domestic and overseas meetings of the automobile industry and the supporting ones to show products, to get information and to find business opportunities. On the other hand, Changchun should promote the ability to gather information of customers, the one of technologies, the one of materials of automobile industry from the domestic important production locations. The paper suggests Changchun to establish the Northeast information network with Shenyang, Harbin and Dalian, and set up the information network of other regions with Beijing, Tianjin, Jinan, Hefei, Nanjing, Shanghai, Hangzhou, Wuhan, Chongqing, Nanchang, Changsha, Liuzhou and Guangzhou from the north to the south which are the domestic important production bases or main markets or both. It is not only a convenient method for Changchun to set up institutions for information collection in the above cities, but also the foundation of Changchun's domestic complete information network. Moreover, Changchun should build the data bases, analyze and process information in time with Changchun as the center and Beijing, Shanghai, Guangzhou and Chongqing as the branches.

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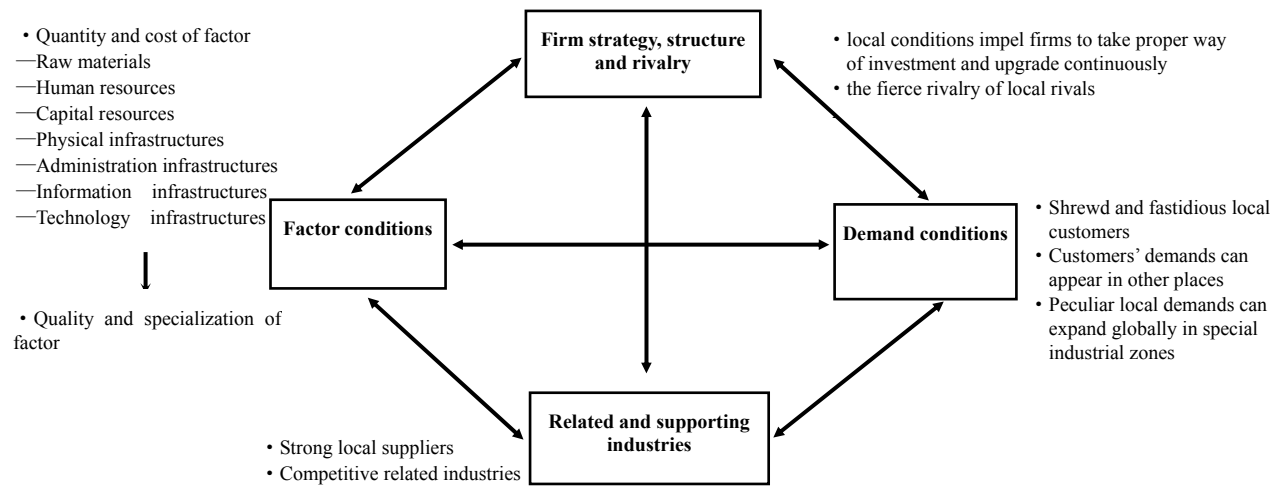


Figure 1. The Sources of Local Competitive Advantage

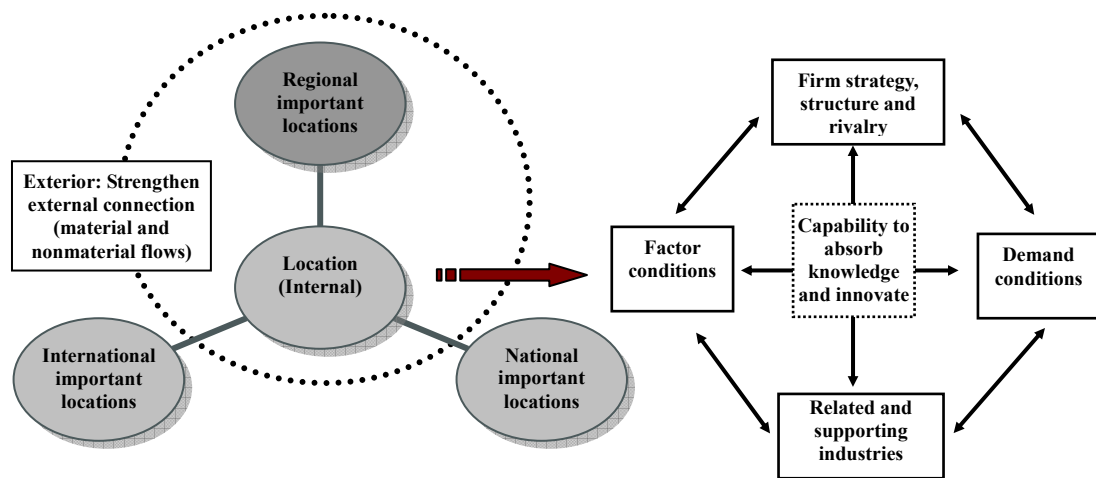


Figure 2. The Model of Competitive Advantage of Locations

Table 1. The evolvement of the meaning of location advantage

Social style	Agriculture	Industry	Knowledge
Means of product ion	Labor and land	Resources, capital and labor	Intelligence resources
Forms of Production	Handcraft production	Machinery production	Knowledge service
Products	Agricultural product and livestock	Industrial product	Product of knowledge service
Main industry	Agriculture and stockbreeding	Industries and manufacturing	Service and high-tech
Production Conditions	Seasons and weather	Capital and labor	Internet and intelligence
Location choice	fields	Cities and towns	Everywhere
Mobility	less	Part	mobility or fixation



Table 2. The index system of competitive advantage of location for the automobile industry

	Classes of index	Indices
Internal competitive advantages	Firm strategy, structure and rivalry	industrial prior accounting-based performance, strength of TNCs, strength of local enterprises and enterprisers
	Factor conditions	Industrial foundation, degree of marketization, strength of the innovation of state-owned corporations, strength of R&D, environment
	Demand conditions	local customers
	Related and supporting industries	Strength of local suppliers, competitiveness of the supporting industries
External competitive advantages	external connection (material and nonmaterial flows)	Infrastructures of transportation and that of communication, network system, and geographical location

Table 3. The location index analysis of Changchun's, Shanghai's and Guangzhou's automobile industry<sup>5</sup>

locations	Industrial prior accounting-based performance	Strength of TNCs	Strength of enpreises and enterprisers	Industrial foundation	Degree of marketization	strength of the innovation of state-owned corporations	Local consumers	Location external connection
Changchun	Good	Excellent	Good	Excellent	Average	Average	Average	Good
Shanghai	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Fastidious	Excellent
Guangzhou	Excellent	Good	Excellent	Good	Excellent	Excellent	Fastidious	Excellent

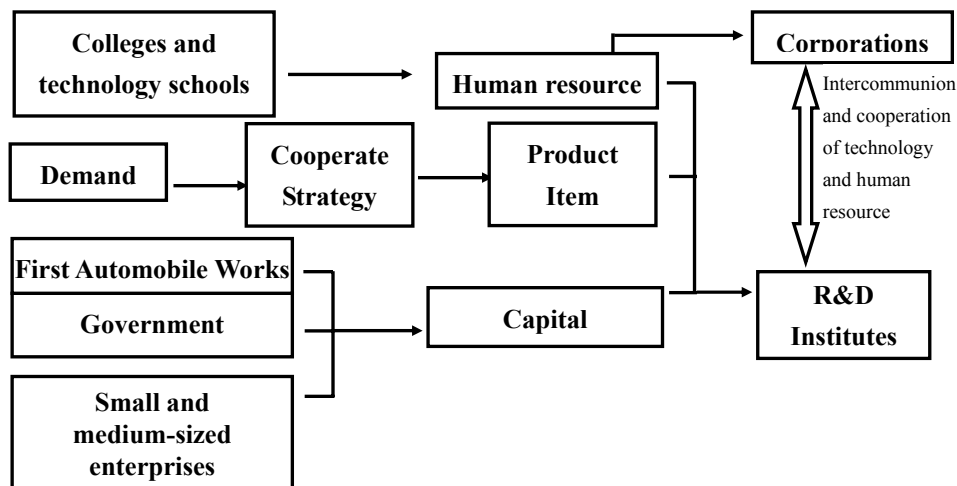


Figure 3. Self-R&amp;D Model of Changchun's Automobile Industry and Related Ones

# Study on the Behaviors of Commercial Banks Based on Bank Particularities

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## Abstract

Through analysis of the particularities possessed by commercial banks comparing with general industrial and commercial enterprises, this article put forward four particularities including the high risk, the particularity of the credit market, the particularity of bank product and the particularity of the bank industry. Based on these particularities, we should not follow the common enterprise theory in the industrial organization theory when we analyze the functions and behaviors of commercial banks, and we must understand the optimal selections of commercial banks according to their particularities and limit conditions.

**Keywords:** Commercial banks, Particularity, High risk, Credit market

The function of commercial bank is to make a mickle by many a little and utilize its own financial agency function to translate family savings into the investment of enterprise and realize the trans-position and trans-term deployment of the resource. The agency function of commercial bank is that the bank possesses the predominance of information asymmetry of both capital supplier and demander and utilizes its own supervisory function to solve the problem of agency. The commercial bank possesses the particularity of enterprise, but it is obviously different to other industrial and commercial enterprises, which particularities are presented in following aspects.

## 1. The high risk of commercial banks

The nuclear function of commercial bank is its function of risk management, but the commercial bank still has higher risk itself, and its risk is presented in following characters.

(1) The capital of commercial bank is less and the financial lever is higher. Under the theoretical frame of M-M, the behavior of enterprise is independent of its capital structure. However, the real world is the world that both trading sides have incomplete and asymmetry information, which will induce the trading costs, therefore, the ideal ambit of M-M without frictions is still an ideal analysis model. Comparing with other industrial and commercial enterprises, the capital assess ratio of commercial bank is much less. According to the requirements of Basel Concordat, the capital adequacy ratio of commercial bank should achieve 8%, which means the assets to debt ratio of commercial bank will achieve 90%. Therefore, the financial lever of commercial bank is much higher than common industrial and commercial enterprise. Excessively higher assets to debt ratio must means larger financial risk, and just as that the capital chain rupture of other industrial and commercial enterprises will induce the bankruptcy of these enterprises, the bank will induce bankruptcy in the financial panic. To prevent the deficiency of fluidity, the commercial bank will keep some repertories to fulfill depositors' withdrawals, and it will also save corresponding reserve requirements in People's Bank of China to deal with unexpected situations. To prevent the payment conjunctures of commercial banks, many countries will implement deposit insurances or offer national visible or invisible guarantee for commercial banks. As viewed from the characters of banks, their character of large sized debt management decides their character of loan, i.e. their most customers are mature enterprises, not middle and small sized enterprises.

(2) After the bank is bankrupted, the government will generally save it because of its large exterior character. The anticipations of "too big to fail" and the government invisible guarantee exist in the interior of the bank. Because of the existence of salvation example, the superior managers of the bank will come forth the problem of moral risk because they will anticipate the possible behaviors of the government, i.e. they will ignore the risk prevention of the operations engaged by the bank or implement investments with high risk. But when the bank bankrupts, the government usually rejects salvation. The behavior of the bank has strong exterior character. On the one hand, the bank solves the problem of trans-term deployment of the capital through the agency, and realizes the optimization of the resource, so it has strong positive exterior character. On the other hand, when the bank bankrupts, it may harm many enterprises and families, even induce the bank crisis and economic crisis, so relative to the bankruptcy of enterprise, the negative exterior character of the bank bankruptcy is much larger. After the risk and the crisis of the

bank occurs, to avoid large negative exterior character, most risks are assumed by the government and the society, and the final losses are the benefits of the depositors and the government, and the losses of the enterprise bankruptcy are mainly assumed by shareholders.

(3) The regulations assumed by enterprises are less in the management activities. Because the commercial bank is mainly engaged in the capital operation of the currency, and a great deal posts and employees contact with the money directly or indirectly and more face the seductiveness of the money, so the moral risk and the operation risk faced by the commercial bank are very prominent, and the very strict system and management are necessary. The bank will face more supervision. For example, except for the banking regulatory commission, if the enterprise comes into the market, it is also regulated by the securities regulatory commission, and if it comes into the market in foreign countries, it will so be regulated by foreign corresponding supervisory laws and regulations. For enterprises, there is no coherent arrangement, but the Basel Concordat required the capital adequacy ratio to the global bank industry. The creditors of the commercial bank are relatively dispersive, and because of the limitation of the costs, the bank is hard to supervise these creditors, and the bank may adopt the hitchhiking behavior. Under this situation, to prevent large exterior character, the country usually will supervise the common products.

(4) The credit market is not a balanced market. The product market usually can achieve the balance of the supply and demand. But in the credit market, the credit distribution always exists. Comparing with the product market, the credit market generally is not a completely competitive market, but a market with oligarch monopolization or oligarch competition. Therefore, the demand of the loan is larger and the supply of the loan is smaller, and the price confirmed by the commercial bank is always higher than the market price under the complete competition, but the loan amount of the supply is always lower than the loan quantity under the complete competition. The loan price among banks is not confirmed by the auction principle of the product market and the service market, i.e. the principle that the buyer with higher price gets the loan, so the profit of the bank is based on the security, and to avoid the converse selective behavior under the asymmetry of information, the loan price confirmed by the bank is lower than the price of auction. There is only limited competition among banks, and the market behaviors are financially regulated by many aspects, and its normality is the monopolization market or the oligarch market, and the credit market is usually in the unbalanced state. But the enterprise generally suffers less regulation, and the product market is in the completely competitive state, so it is usually balanced.

(5) Under the condition of incomplete symmetry contract, the benefit conflict exists between both debit and credit sides. The consigner's and attorney's benefits are abhorrent. Because of the existences of incomplete information and asymmetry information, debit customer can not identify loaner, and when the debit customer falls across the excessive demand of capital, if the loaner hastily enhances the interest rate, he will compel the debit customer with low risk to quit the market, and leave the debit customer with high risk, and the conversely selective problem will occur. Under this condition, the debit customer usually will give up utilizing the interest means to fulfill the excessive demands, and implement the credit distribution by other means in order to minimize the risks of converse selection and moral risk in the loan. The credit distribution is a sort of special contract relationship in the capital market.

(6) In the product market, most products realize the marketization. But in the market of commercial bank, many developing countries have not realized the marketization such as the marketization of the interest rate, and large numbers of financial restriction and policies exist, and the resource is deployed by the rent transfer or the redistribution of the rent. Therefore, the regulation of lending rate will also induce the price distortion and popular dear money, or the bank breaches the regulation through the innovation of the product.

## **2. The particularity of the product offered by bank**

The bank offers the deposit product and the loan product and implements the functions of payment agency, coin creation and policy conduction, and the products offered by the bank and other visible products and service products have the aspect of the particularity.

(1) General enterprises have the upper course and the lower course in the industrial chain, so they are easily integrated, and the routes of the integration include transverse integration and lengthways integration. But the products of the bank possess high homogeneity, so most integrations of the bank are transverse integration, and at the same time, the products of the bank are easily simulated. The product of commercial bank is contract. And through the combination of the products, the bank can implement diversiform investments to reduce the risks of the investments. But the products of enterprise are relatively limited, so the diversification of the product is limited.

(2) The product transaction charge of the bank is relatively low. Because of the development of modern computer technology and network technology, it is very conveniently to implement transactions such as payment and balance through the product of the bank, which is very different to the regionality that other products or services are limited

in, and other industrial and commercial products have large transaction costs induced by the transformation of time and space, but the products of the bank can be traded in 24 hours and in the whole world.

(3) As a sort of financial product, the loan is different to the visible commodity which is the timely transaction through bargaining between supplier and demander, and it is a sort of spot transactions in most situations, and after the transaction, the ownership and the using right change simultaneously. But for the loan, only the using rights change after the transaction happens, and the ownership is not really transferred. The demander should return interests monthly and return corpus at the end of the term of the contract, which not only includes the time value of the capital, but embodies a sort of idea of long-term contract. So the pricing of the loan is to price the using value in certain term considering the risk. Under fixed risk, the using value in certain term is higher, its price is higher.

(4) Except for on-balance-sheet operation of indebted assets, the commercial bank also has large off-balance-sheet operations. So comparing with other enterprises, the balance sheet of commercial bank is more easily faked, especially the income share of off-balance-sheet operation is higher and higher, the behaviors of the commercial bank which utilize the off-balance-sheet operation to implement the investments with high risk (such as futures options and hedge transactions) are more and more difficultly supervised, for example, the British hundreds years' shop Barings Bank was closed down by large transactions of derivative financial instruments.

### 3. The particularity of bank industry

(1) The character of bank scale economy is obvious. With the extension of assets scale of the bank, it can deploy its assets and debts in larger range to reduce the capital costs and management costs, which presents the increase trend of scale reward. The bank industry possesses obvious character of scale economy, and in 500 largest banks in the world in 2004, the minimum capital achieved 0.64 billion dollars and the minimum assets scale achieved 20 billion dollars. Luyang (2005) had proved that the profit increase is highly positive correlative with the increase of assets scale in China stock banks, which could also explain the interior reason why the present foreign financial institutions were wild about merger and share but the direct management developed slowly. Foreign situations also proved that banks had scale effect. In 1996-2000, the capital return of community banks which assets scale was less than 0.5 billion dollars in US was 12.7%, the proportion of non-interest income was 16.8%, and the capital return of community banks which assets scale was in 0.5-1 billion dollars in US was 14.3%, the proportion of non-interest income was 21.9%, and the capital return of community banks which assets scale was above 10 billion dollars in US was 16.5%, the proportion of non-interest income was 39.8%.

(2) The commercial bank is in the industry with intensive science and technology, intensive capital and intensive technology. The information has extremely important value to the commercial bank, so the maturity and arrival time of the information is very important to the management of the commercial bank. The commercial bank adopts modern IT technology and purchases advanced equipments to create competitive predominance in the aspects of balance, payment and information communication. At the same time, because of the encouragements avoiding supervisory regulations and spread profits, the financial innovations emerge in endlessly and the whole industry embodies the character of innovation.

(3) The credit standing is the lifeline of the commercial bank. The management objective of commercial bank is the currency, and the depositors will deposit their capitals in the commercial bank because they recognize and affirm the credit of the bank. In the same way, the commercial bank will loan the capitals out because it affirms the customers' credits. Once the reputation crisis happens in the commercial bank, it will face competition even bankruptcy. When the financial panic occurs, the government will stabilize the depositors' confidences and recover depositors' credit standing to the bank.

(4) The commercial bank is not an enterprise which takes profit as the core completely. On the one hand, the management objective of commercial bank is the combination of security, fluidity and productiveness, which is different to the objective that the enterprise treats the profit. On the other hand, because of the existence of exterior character, the commercial bank can ensure the safety of financial system even the micro economy to avoid its bankruptcy. When the commercial bank pursues its security, fluidity and productiveness, it should pay attention to the social benefits and more assume social responsibilities than common enterprises. There exist more information asymmetries and more multiple agent relationships in the commercial bank. The depositors of commercial bank can not know the assets combination sheet of the bank, and the commercial bank can not fully know the loaners' information. In the same way, there exist the problems of incomplete information and information asymmetry between shareholders and managers in the commercial bank and between the managers and their underlings (such as creditor employees), which forms the multiple agent relationships among "depositor- shareholder- manager-operation personnel- loan enterprise".

(5) Based on the moral risk of middle and small sized individually-run banks and the large exterior character of the

financial industry, various countries in the world adopt the state controlling mode to the bank, or forbid private stock controlling to the bank form the legislation, which is to prevent the association transaction and interior control.

(6) Both entry and exit of the bank industry have costs. In many countries, the entry of the bank has bulwark, and the exit of the bank will also has large of costs. For example, the banking regulatory commission regulated that for the paid-up registered capital, the minimum limitation to establish the joint-stock commercial bank is 1 billion RMB, and the minimum limitation to establish the joint venture bank and exclusive capital bank is 0.3 billion RMB. If the foreign financial institution is the initiator or strategic investor of the stock commercial bank, its total assets should exceed 10 billion dollars and follow the principle of “holding shares for long terms, optimizing governance, business cooperation, and evasion of competition” and the proportion of shares should not exceed 20%. But for the enterprise industry, most enterprises can freely entry and exit and the obstacles don’t exist. The competitive theory of the enterprise is not suitable for the bank. In any country, there is entry limitation for the bank, and the management permit of the bank has very high value of concession, but the enterprise basically has no entry and exit bulwarks.

#### **4. Conclusions**

Above analysis discussed the high risk of commercial bank, the imbalance of credit market, the particularity of bank product and the particularity of bank industry, and we can more fully understand the function and the behavior of commercial bank. And because of the limitation of the particularities, the optimal selection of commercial bank is different to the optimal selection of enterprise. Therefore, the method to explain the behavior of commercial bank according to the common enterprise theory in the industrial organization theory has large limitations.

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# Recruiting Managers with the Lure of CPD

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## Abstract

Increasingly managerial posts are being advertised with CPD (Continuing Professional Development) as a stated benefit alongside the usual job benefits of bonus, car, life assurance etc. Yet CPD as a job perk, rather than an integral element of the person specification, not only challenges the underlying premise of CPD; it is morally inappropriate.

While CPD has become a universal term, whose use covers a wide range of professions (e.g. law, accounting, architecture, teaching, engineering, town planning, and medicine), in this paper, we specifically focus on CPD for managers, particularly examining why managers should be concerned with CPD and discussing the implications for managers of CPD being specified as a job benefit.

**Keywords:** Managers, CPD, Recruitment, Job Advertisements,

## 1. Introduction

Increasingly managerial posts are being advertised with CPD (Continuing Professional Development) as a stated benefit alongside the usual job benefits of bonus, car, life assurance etc. Yet CPD as a job perk, rather than an integral element of the person specification, not only challenges the underlying premise of CPD; it is morally inappropriate.

## 2. Discussion

### *2.1 What is Continuing Professional Development (CPD)?*

Continuing professional development (CPD) is the educational and developmental work and learning that individuals undertake as members of their chosen occupation. It can be considered as the process of constantly updating personal skills and knowledge. Continuing (or continuous) professional development has been described as “the maintenance and enhancement of the knowledge, expertise and competence of professionals throughout their careers according to a plan formulated with regard to the need of the professional, the employer, the profession and society” (Madden and Mitchell 1993, p12). While Kennie and Enemark (1998, p.162) provide another useful definition, “The systematic maintenance, improvement and broadening of knowledge and the development of personal qualities necessary for the education of professional and technical duties throughout the practitioner’s life”.

The underlying premise of CPD is to maintain and continue to develop one’s occupational competence which is deemed vital to maintaining one’s professionalism. Consequently, a person working as a professional should remain alert to new ideas, techniques and developments in their profession (Taylor, 1996). They should therefore update their skills and knowledge through a wide range of activities including but not limited to: reading, attending courses, seminars or conferences, learning and imbibing new technologies, and undertaking similar activities that would add value to existing knowledge and competences. However, Friedman and Philips (2004) highlighted the ambiguity in the definition of CPD noting as follows. “Professionals have a limited view of CPD—seeing it as training, a means of keeping up-to-date, or a way to build a career”.

Increasingly, professional associations claim that CPD is: part of lifelong learning; a means of gaining career security; a means of personal development; a means of assuring the public that individual professionals are up-to-date; a method whereby professional associations can verify competence; and a way of providing employers with a competent and adaptable workforce. It would therefore be appropriate to emphasise that CPD is undertaken to maintain and enhance professional competency and the credibility of professional qualifications, with the outcomes

being new and reinvigorated knowledge, skills and performance (Taylor, 1996; Zajkowski, Sampson and Davis, 2007). CPD is therefore a means of promoting learning, development and professionalism among practitioners, as well as a means by which the profession could be seen to be maintaining its standards.

### *2.2 Why should managers be concerned with CPD?*

The above definitions infer a necessity for CPD for individuals to update professional skills and support best practice in the occupational discipline. This must be particularly important for managers, who find themselves subject to technological changes affecting, for example, information management, and therefore look to CPD as a means of adapting to this changing environment by developing new skills. This has led Hyams (1998) to feel that CPD is especially crucial for professionals in order to remain viable in the job market. This theme of job viability suggests the necessity for managers to embark on a life-long learning programme in order to avoid obsolescence of skills. Similarly, Friedman, Durkin and Phillips (2000) note that the consequences for an individual of not undertaking CPD activities are loss of professional standing and the inability to compete against other individuals in the occupational area, which will ultimately limit career advancement.

Furthermore, change is pervasive and affects the work of every manager. The world of work today is dynamic and turbulent and managers as professionals are wont to adapt to their rapidly changing work environment. In order to keep up with change managers should find CPD useful (Kennie and Enemark 1998). In fact, many professional management associations (e.g. Chartered Management Institute) recommend that their members should take part in a minimum number of hours or training units of CPD activities in order to maintain currency of membership (Fok and Ip, 2006).

The need for ongoing professional development is well-established, both from the perspective of service quality and from the viewpoint of individual career development and marketability. While the benefits of CPD for managers are clearly stated, there has been a recent trend in job advertisements to attempt to attract individuals to management positions by offering structured CPD activities or support. This represents a significant development by employers, to use CPD as an enticement to apply rather than using a record of CPD as an element of the person specification.

### *2.3 CPD as a Job Benefit: The Extent of the Issue*

An observational survey of a UK jobs website, using "CPD, Manager" as a search term, produced 123 hits (accessed 8<sup>th</sup> February 2008). However, this included managerial jobs specifying CPD as a person requirement, or a requirement for the manager to deliver CPD training to other staff. By subsequently removing the non-job benefit CPD advertisements, a total of 8 matches was derived (Table 1).

Advertisements specifying CPD as a job benefit was not limited to one specific industrial sector, but included health, engineering and construction. The advertisements ranged from a subtle "encouragement" for CPD, to a more explicit "...will participate". Yet these are written in an enticing, marketing-astute manner, to encourage applications without really committing the employer. Apart from the one advertisement stating "2 days paid CPD leave", there is typically no value attached to CPD benefit, and therefore it will be difficult for individuals to assess the true value of the benefit on offer. Moreover, there is no means of translating the CPD benefit into tangible, measurable form in the same way as a pension, or life assurance can be. In order to compare one managerial post against another, a specified budget figure would be useful (e.g. "Up to £5000 per annum to be spent on personal CPD activities"). Presumably, it is left to the individual manager to negotiate their own CPD value, which could see some losing out, or even deter some applicants.

### *2.4 CPD as a job benefit?*

By referring to CPD not only gives a contemporary feel to position and organisation, it clearly demonstrates an employer's commitment to training and development of its human resources. This Guthrie (2004) feels, also highlights a clearer career progression for individuals and therefore they should be more attracted to that organisation (one of the job advertisement specifically mentioned a ready career progression – "the company provides its employees with a clear career path"). There is however, a potential danger for organisations by offering CPD as a benefit, as it might merely encourage applicants to apply, and use the training as a stepping stone onto higher positions with other employers. Nonetheless, as most employers complain about inadequate skills levels among managers (Bosworth, Davies and Wilson, 2002), by referring to CPD in this manner, the company makes a positive contribution to updating of skills of its workforce.

However, managers typically operate in a busy, pressurised work environment, which could limit their availability to undertake development activities – the benefit might therefore be lost if not taken in the year it is offered. Similarly, the individual might suffer increased pressures in order to take advantage of the CPD activities being offered – the extra stress and workload incurred cannot therefore be considered as benefits.

Moreover, we are not informed in the job advertisements how the individual might receive the CPD benefit – will there be the usual business case and myriad of forms to complete in order to make to participate in training? What does the organisation consider to be CPD? Will the individual have to contribute themselves, either financially or in personal time? Is the benefit conditional – will training budgets be cut if the business experiences a downturn in trading? Is CPD in this context simply replacing the initial induction training that assist individuals in settling into the new job and raising their performance to normative levels? The idea that CPD is a job perk also suggests that individuals must take a long-term perspective that the development opportunities offered will enhance career prospects, and these must be sacrificed against any tangible job benefits that the individual might seek at the present (e.g. a healthcare scheme).

Jones and Robinson (1997) are critical of companies in their handling of CPD, stating issues to include, lack of coherent policy and little evidence of coordinating development activities. Perhaps more startling was that Jones and Robinson (1997) found that most organisations were unable to cost professional development activities. If this is the case for the majority of organisations, how can they know the cost in time or money of CPD activities, to be able to offer it as a benefit? Perhaps more worrying is that Wills (1998 cited in Sandelands, 1998) finds that CPD is perceived as a luxury in most companies, and is usually scrapped in adverse trading conditions.

Additionally, the reference to mandatory CPD in the observational analysis of job advertisements – “The post-holder will participate...” represents a more sinister development. Despite some support for mandatory CPD among employers (Toon, 1998), Guthrie (2004) identifies that very little CPD is actually instigated by the employer, mostly originating from the individual. In the same way Watkins (1999) warns professional associations to be wary of adopting compulsory CPD, this approach could deter potential job applicants if they perceive CPD as not a benefit but in fact an additional burden to workload.

Despite attempts by some professional bodies to link CPD to the maintenance of membership status, the interest in formal CPD schemes among professional management associations is low. By employers offering it therefore as a job benefit knowing the take-up will be similarly low, the employer will undoubtedly incur little or no cost.

Yet CPD remains irresistible for professionals. Individuals are now expected to engage in education and learning throughout their lives to maintain and progressively update skills and knowledge. For a manager working in a dynamic organisational environment, CPD becomes of paramount importance to contribute to organisational performance. Consequently, it is this increased usefulness to the business that moves CPD from being a job benefit for an individual, to something that must surely be embedded in the job itself. In particular, health professionals, and similarly, health managers need to have evidence of CPD in order to practice – it is a necessity of the job, for which employing organisations should make provision, not offer it as a benefit (or reward).

Several academic writers insist on managerial development being linked to work activities (Garavan Barnicle and O’Suilleabhain, 1999, Raelin, 1990). Moreover, CPD activities can complement workplace development schemes such as appraisals and Investors in People (IIP) awards. Here, the relationship between CPD and organisational performance is clearly apparent and must be important to businesses to enable them to cope with external change more effectively.

### **3. Conclusion**

To secure employment with an organisation that takes a positive approach to CPD must be precious, since the employer is clearly reinforcing its commitment to the career progression of its employees. Yet at the same time, it is taking advantage of increased work performance from that individual, and helping develop a learning organisation. A record of CPD activities is therefore important for individuals to provide employers with evidence of maintaining professional skills, and can support assessment against higher standards when seeking promotion. Thus CPD creates a win-win situation for both the organisation and the individual, and so rather than being a job benefit, should be an integral part of the job itself.

Moreover, CPD not only increases the usefulness of individuals to the business but also raises the professional standing of professionals by extending knowledge and skills. According to Houle (1980), CPD is a key contributor to the professionalisation of an occupation area, which is vital for non-statutory bodies to raise the profile of the profession, especially among employers. Coen (2004) argues that CPD is congruent with professionalism, since continued credibility in an occupational area is maintained through development of competences. To therefore state CPD as a job benefit suggests an organisation merely feeding-off the professionalism of the individual which is morally inappropriate. As a result, professionals should insist that CPD is at the very core of any job they apply for, and not merely an incentive to entice application.

Nonetheless, this article has only sought to raise fresh debate on the topic of CPD. What is now required is further empirical research into the perceptions and attitudes of those affected by CPD as a job benefit, before a definitive conclusion can be drawn.



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Table 1. Observational Findings of CPD as a Job Benefit for Managers

<b>Job Positions – (Samples)</b>	<b>Quoted CPD Benefit</b>
Project Controller	“Flexible working environments with organisations that actively encourage CPD”
Ward Manager	“”We offer a comprehensive CPD programme”
Project Manager	“Active support for relevant CPD”
Case Manager	“The post-holder will participate in the monthly CPD/Training programme”
Value Manager	“The company provides its employees with a clear career path, with progressive training and CPD initiatives”
Administrative Support Officer	“CPD is actively encouraged and supported”
Pharmacy Manager	“2 days paid study leave per year for CPD”
Engineering Manager	“Full benefits include pension, BUPA, life assurance, CPD”

# An Innovative Pattern for Management Capacity Cultivation

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## Abstract

Management, as a kind of capacity, should be formed in practice. Currently, however, management majors are mainly taught in knowledge instead of any platform or environment. As a result, students find it hard to convert their management knowledge into real capacity. In order to solve this problem, this article creates an innovative pattern for cultivating students' management capacity.

**Keywords:** Management capacity cultivation, Project team, Innovation

## 1. The Current Situation of Management Capacity Cultivation in Management Majors

Currently, some management courses are offered to management majors, such as management principles, project management, financial management, strategic management, supply chain management, logistic management, operation management, service management, information management, human resource management and so on, which provide basic knowledge for these students while lacking in a platform or environment for students to practice their knowledge, hence resulting in their inability in actual management practice.

It is surely the best way for students to develop their management capacity in actual management of enterprise routines, but it is hardly possible for them. Even if they serve as an intern for a company, they can only stand by to observe and learn the management styles and skills of the leaders there instead of participating in the management process, not to mention management practice. Therefore, it won't work to cultivate students' management capacity through exercitation in companies.

Although the students' union in universities and colleges will help to cultivate students' management capacity, it is available to some, not all students and it just involves some student routines, which are quite different from the real enterprise management in content and complexity. Consequently, this will not do much for the formation of enterprise management capacity.

Therefore, the ways and methods for the management capacity cultivation in management majors seem to be a tough and urgent issue. Since there are a few researches in this field and no effective pattern for management capacity cultivation nowadays, this article aims at creating a new pattern for that.

## 2. The Main Contents of Management Capacity

Management capacity, especially that in enterprises, includes a variety of abilities in leadership, planning, decision making, project management, organization of resources, construction and operation of teams, personal communication and coordination, problem analysis and resolution, coping with conflicts, self-management, innovation and so on. Let's take project management as an example:

Here project management refers to the capacity to carry out strategic plans and convert those ideal targets into practice, which includes quite a lot of management ranges such as in time, range, cost, quality, human resources, potential risks, communication, purchase, contract and comprehensive management.

The following abilities should be included in project management capacity:

### 2.1 The Ability to Lay Down Strategic Planning for Project Management

Strategic planning is a process to form and conduct a decision about the future development of an organization, through which it will adapt itself to the constantly changing environment.

### 2.2 The Ability to Divide a Project

This specific ability refers to dividing a project in order to manage and control with greater convenience. Generally, project management can be divided into starting, planning, conducting, controlling and ending processes, each of which can be further divided into many subparts.

### 2.3 The Ability to Integrate a Project

The overall nature of a project calls for integrated management, in which different elements can be coordinated to realize the common target in performance, schedule and budget, hence accomplishing the ultimate goal of the whole project. Here, this ability can be further divided into the integration ability in project targets as well as processes.

In our actual project management, the project manager is expected to regard the specific project as a whole in which the correlation among different parts as well as that between individual projects and their roots should be paid much attention to. Only with a clear idea about the general environment and project can a project manager produce a definite goal and reasonable plan for that.

### **3. The Innovative Pattern for Management Capacity Cultivation of Management Majors**

#### *3.1 The Idea of Management Capacity Cultivation Pattern*

Guided by teachers, students can form their sub-teams voluntarily, of which they are planners and implementers. They are allowed to refer to materials, design their implementation plans for their projects and conduct their own management practice. Compared with the complicated course stuff, these planning and implementation activities are actual, comprehensive and creative. It is through designing their own projects and applying what they have learnt into them that management majors come to understand the core of management and form their actual management capacity.

As is well known, the knowledge obtained in one's own experience tends to be unforgettable and become one part of his ability. Accordingly, students will form their management capacity by acquiring their personal experience from those elaborately-designed activities and virtual circumstances and sharing their individual experience with each other to enhance their understanding under the instruction of teachers. This team project design and management is an advanced independent leaning style, which applies not only to classrooms but also outside them. As a result, students will have their innovation, organization, communication, expression, project management capacities fully developed as well as acquire basic management knowledge.

#### *3.2 The Concrete Process of Cultivating Management Capacity*

Teachers make a general planning to produce a general project with specific requirements. For example, in accordance with the characteristics of the city they live, the teacher can put forward with a project plan to establish the brand of his city. Thus, with a clear idea about the actual value and feasibility of this project, students will not conduct their creation blindly. Their knowledge and sense of vocation about the city they live will inspire their interest and passion to practice their creative ability in such a real-life project.

Students form their sub-teams of 5 to 10 voluntarily to plan and design their individual sub-projects based on their interest, specialties and reality. In each sub-team a project manager should be chosen to take charge of the organization and distribution of team activities. During the whole process, every participant will obtain some relevant management theories, knowledge and skills, practise their communicative ability and cultivate their self-confidence and sense of cooperation.

After their projects proved feasible, efforts should be made to clarify their targets and to lay down feasible plans and action details. Students in the same team are expected to unite to achieve the common goal with their clearly-divided responsibilities and rights. They will take some virtual posts such as project manager, financial minister, sales minister, personnel minister and so on to conduct strategic analysis and control the quality, time, risk of their projects.

Teachers should organize some students to design their project management website, on which all teachers and students can comment on the achievements in different periods made by individual teams and give immediate advice for amendment.

When conducting their projects, team members can discuss and analyze the problems they come across and solve them by trying a variety of methods according to what they have learnt in class.

A representative appointed by each team reports their periodic summaries to the whole class.

Every week, all students and teachers will be given a report about what is going on in each project and give their advice and comment.

At the close of a term, each team is expected to submit their overall project report. Teachers will give a comprehensive assessment about their report, organize a lecture tour for these teams around the whole school and publish invitations for investment in these projects with the hope to convert them into actual ones.

### **4. The Actual Effect of the New Management Capacity Cultivation Pattern**

Actually, our above practice has led to obvious effect:

(1) Students' enthusiasm for learning has been inspired and their leaning and innovative abilities have been improved. Students' enthusiasm for learning can be inspired by converting theoretical knowledge into interesting team activities. Although the depth and level of their researches are limited by their knowledge and ability, students'

creativity and individuality and their sense of innovation can be fully exerted in their independent comprehensive practice. Consequently, innovative forms bring about innovative contents and methods.

(2) Students' sense of participation, satisfaction and responsibility as well as communicative abilities has been developed. During the whole process, as active participants, students have to take an active part in their team work before, during and after class, hence exerting their organization, expression and personal communication abilities, enhancing their self-confidence and developing their sense of satisfaction. In addition, the leaning, questioning and stimulation among different project teams will encourage students to apply their theoretical knowledge into actual practice, during which members from different teams will exchange their ideas and opinions, hence developing their communicative skills.

(3) Students' team spirit and sense of cooperation have been developed in their team activities, during which project managers will arrange every member's task reasonably in order to cooperate to accomplish their team tasks faster and better.

(4) Students' ability in analyzing, solving problems and exerting their knowledge in a comprehensive way has been enhanced. Through their team activities, students will obtain practical methods and abilities to employ what they have learnt to reflect on and solve problems instead of just empty and abstract theories. In this way, their abilities in contact, making decisions and employing management knowledge have been improved.

(5) Students' expression ability has been improved greatly. In their project reports every week, they have to stand in front of the whole class to report their project achievements with multimedia courseware. At first, some students only bury themselves into their written speeches without confidence to face the class and proper rhythm. However, with more exercise, the example set by those excellent students and instruction from teachers, they tend to be calmer and controlling in their looks, intonation, tempo, gesture and other aspects.

(6) Students' organization ability has been improved. In their organized teams, all members have their respective responsibilities and rights as well as cooperation. Therefore, in the distribution, implementation and examination of the tasks in every period, their organization ability has been fully improved.

To sum up, this new pattern, characterized by the multi-dimensional cultivation of students' management capacity, has exceeded the convey of textbook knowledge and have converted teachers' roles into not only the organizer, instructor, promoter and evaluator but also the developer, designer and director of students' general learning project. And students are the designer, organizer, implementer of their sub-subjects. With the concrete guidance of their teachers, students will unite to carry out the design and practice of their projects with clear division of labor and common efforts. By communicating, assisting, encouraging and appreciating each other, all these teams will accomplish their general goal successfully, in which students' professional knowledge will get expanded and improved and their abilities in leadership, planning, decision making, project management, organization of resources, construction and operation of teams, quality management, personal communication and coordination, problem analysis and resolution, coping with conflicts and self-management will be enhanced. In addition, students' creativity and interest in study will be inspired, resulting in higher efficiency.

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# A Study on Innovation Capability

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## Abstract

As a whole, the enterprise's track of technical capability in the developing countries has three technology platforms. They were arranged step by step as technology import & imitation capability, assimilation capability and independent innovation capability. They also can be called as copy capability platform, creational imitation capability platform and independent innovation platform. Every platform's advance all needs huge supply from enterprise's technical innovation capability. Technical innovation capability composed of several technical innovation factors has its own integer function. Its advance cannot be deviated from technical innovation factors' improvements. It's absolutely not one part's or one factor's advance but all factors' improvement not only in quantity but also in quality. On the basis of comparison between the imitation innovation and independent innovation, this paper analyses different factor's change traits in the process of innovation capability's evolution. After that, this paper makes an empirical study.

**Keywords:** Imitation innovation, Independent innovation, Baosteel

## 1. Introduction

Since 1980s, Western scholars initially had studied the studying process with the focus on how to enlarge and deepen their capability through creating knowledge. Equally, many Asian scholars also made many researches on the mechanism about how to improve technical capability of the enterprises in the developing countries. And they had found an admitted pattern of "import---assimilate---innovation". This pattern indicates in nature the basic progress of technical capability improvement of the enterprises in the developing countries.

According to the origin of technology source, the innovation mode can be divided into three types: imitation innovation, cooperative innovation and independent innovation. However, with the external environment's change and technical development and innovation, sometimes one enterprise did not depend on one pattern of technical innovations. Through recalling some correlative researches, it was found by us that there were few researches on the capability evolution from one innovation mode to another and on the factors of innovation capability. This paper aims to analyze and compare the implementation points of all factors in imitation innovation and independent innovation mode. And then, with the case study of Baosteel Group, this paper discusses the conversion process of innovation factors in the capability evolution.

## 2. The comparison between imitation capability and independent capability

The above-mentioned three innovation modes can be classified into two major kinds: 1) the independent innovation is a technical innovation pattern which obtains knowledge from interior enterprise. In other words, the enterprise obtains the technical knowledge and technical abilities in the R&D process by itself. 2) the imitation innovation and cooperative innovation are the other technical innovation patterns which obtains knowledge from external world.

Through analysis from the angle of innovation process, the innovation capability can be decomposed into five aspects: decision-making capability, R&D capability, productive capability, marketing capability and organization capability. There are many differences between imitation innovation and independent innovation.

From the table above, it can be known that the imitation innovation mode emphasizes on progress design, quality control, cost control, huge product, marketing and so on. In a word, it focuses on the money and technology at the end of innovation chain. In this mode, the enterprise establishes its competitive status and gains benefits by producing goods with more competitiveness on function, quality, or price than other enterprises.

In the same market, generally speaking, independent innovation has no meaning if its goods don't lead the market. Independent innovation enterprise should aim to pursue leading status in technology. But technical leading needs market development leading. Only through changing commodities, can the technical development achievements bring huge benefits to the enterprise. As a result, the independent innovation enterprises shall aim to the market leading. They shall prevent their market from being rapped and their technical achievements from being burgled. So in the independent mode, the enterprises should put enough technology and money in every step of innovation chain.

They should shape their own core capabilities and keep their leading status. Or else, it's easy to be defeated by competitors.

Table 1. Comparison between imitation innovation capability and independent innovation capability

MODE FACTOR	Imitation innovation	Independent innovation
Decision-making capability	Swift response, Discernment to valuable technology and information	Establishing appraisal and selection mechanism Arranging expert date for consultation Forming a technical innovation committee
R&D capability	Studying and assimilation capability, rehabilitation capability, especially rehabilitating production function	“Production, studying and researching” Strong technical development capability Strong capability to afford risk Huge fund Patent to protect core technology
Production capability	Cut down the cost Enlarge the market	Training, Accumulating production and management experience
Marketing capability	Establishing marketing network	Finding potential market Opening up new market and making advertisement Technical standardization Finding better places
Organization capability	Consider more imitation innovation Cultivating its own independent innovation capability	Conforming to all innovation factors Coordination at all levels Inspiring all innovation bodies

### 3. Technical innovation capability's evolution

As a whole, the enterprise's track of technical capability in the developing countries has three technology platforms. They were arranged step by step as technical import & imitation capability, assimilation capability and independent innovation capability (Figure 1). They also can be called as copy capability platform, creational imitation capability platform and independent innovation platform. Each platform has its own focuses on technical capability. Every platform's advance needs huge supply from enterprise's technical innovation capability.

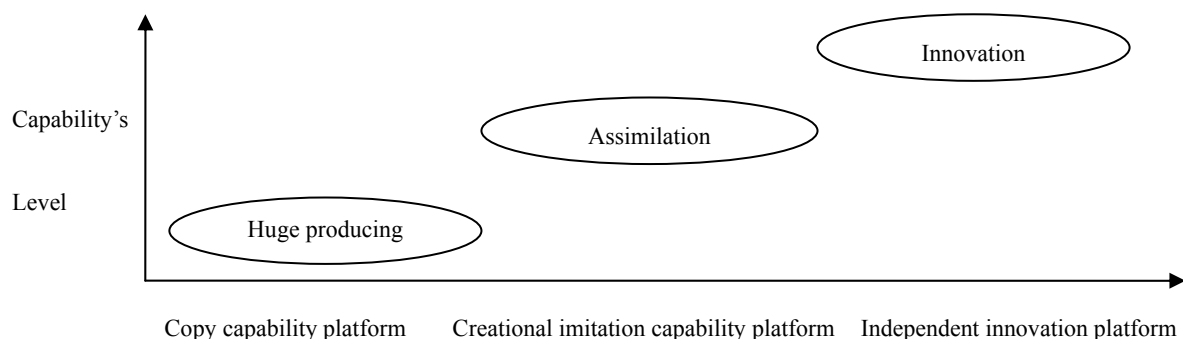


Figure 1. Enterprise's technical capability growth track

The technical innovation capability composed of several technical innovation factors has its own integer function. Its advance cannot be deviated from technical innovation factors' improvements. It's absolutely not one part's or one factor's advance but all factors' improvement not only in quantity but also in quality. Providing innovation factors essentially mean to provide enough capability factors in all steps of innovation process. The capability factors

include manpower factor, fund factor, equipment factor and information factor.

In quantity, the most important factor of manpower factor is the R&D personnel who are usually trained by the university and college or supplied by enterprise, professional industry or foreign countries. The supply of funds mainly depends on the creative funds of the enterprise and companies with the government's special preferential policy, the creative risk fund and mechanism to increase the reservation of the funds. The supply of equipment can adopt the means of import. And based on import, the technical innovation may come into being. The supply of the information depends on the establishment of modern communication system, communication network and the science and technology information system of enterprise who can quickly follow, analyze and process the information.

While strengthening the supply of factors, it also needs to improve factors' quality. In order to improve the quality of manpower, it is important to improve the whole research and innovation capability of R&D personnel by improving the age structure or technique structure of R&D personnel and carrying on the follow-up education for R&D personnel. It is also a good way to attracting scholars from universities or academes to take part in R&D activities to cultivate R&D personnel. To improve the quality of the funds mainly means to distribute capital reasonably in all steps of innovation activities. By effectively arranged, the fund is of great availability in the innovation activities.

The formation and elevation of technical innovation capability is a continuously iterative process. The creative capability of technology can be upgraded based on enhancement. After the creative capability of technology being promoted to a higher level, the new circumstance and the new market competition put forward new request on the quality and the quantity and allocation of technical innovation capability. So it is necessary to cultivate and upgrade the creative capability of technology again. Hence the evolution of the technical innovation capability was formed.

#### **4. A Case Study of Baosteel Group**

As a leader in iron and steel industry, Baosteel Group developed from a new company to a large iron and steel group in the world. Now it has developed into the sixth largest iron and steel enterprise in the world. Since Baosteel Group has been put into production, its development has been always depending on its technical innovation's drive. It all can be seen from three blast furnaces of Baosteel Group. The first blast furnace was made in Japan. With reference to other's design, the second one was made in China. But the third one was designed and made all by ourselves. That's to say, the third blast furnace was an independent innovation result.

The development of Baosteel Group can be divided into three steps. The first step dated back to 1978, called "Baosteel Group project". At that time, the metallurgy technology at home had large gap with the one abroad. Blast furnace's design and construction were done by others else. In the first step, the main purpose of Baosteel Group was to form the assimilation capability through establishing its own R&D department and attracting technical personnel after importing new technology. The first step project was finished in Sept., 1985.

Early in 1983, the second step of Baosteel Group was arranged. The second step had more homegrown technology than the first one. In this step, Baosteel Group took more attention to forming its independent innovation capability especially in its major products. The government made some new decisions about "developing important technical equipment". In order to enlarge its independent innovation capability; the government established the related offices to deal with the related matters. Though cooperating with universities and academes, Baosteel Group realized its own research capability. Taking hi-tech series X as an example, Baosteel Group cooperated with some universities. It developed its independent research capability in continuous learning. Compared to the first step, there was 88 percent smelting equipment made by itself in the second step. The second step of Baosteel Group was finished in June 1991.

With the development of information technology, computer becomes an important tool in modern enterprise management. Baosteel Group planed to install computer information management system and imported two big equipment UNISYS2200/600 and four medium equipments U6000/65. In 1995, Baosteel Group basically installed computer management system. And in 1998, it imported ATM technology and equipment, then researched an information management system for production, supply and sale. With the development, Baosteel Group also took his employees' train as his significant work. Baosteel Group took its training center as its employee training base. It formed its new education system through improvement of the old education mode. It also completed its own incentive mechanism. With this system, it cultivated its employees at three levels: management, specialization and operation. In the third step, Baosteel Group's smelting technology was almost entirely made at home and 85 percent of its steel rolling technology was also made by him.

Emphasis on technical innovation made a big leap. In 2003, Baosteel Group had applied for 166 patents and 117 authorizations. Up to today now, Baosteel Group has accumulated more than thousand patents and more than 721 authorizations.



## 5. Conclusions

It can be known from this paper that with the help of technical innovation capability's development, Baosteel Group has developed into a large group from a small company. It can be seen from its capability's evolution that innovation capability's development cannot depart from the improvement of all innovation factors in quantity and quality..

In the second development and the process of nationalization, the enterprise shall form its own independent innovation capability especially in its core products. Then, it shall enlarge the scope of innovation to process, equipment and installation. And it also cannot depart from improvement of organization management capability, complementation of innovative study system, alliance with universities and academes, establishment of effective study mechanism. Only having a good command of the independent core technology, can the enterprise form the capability of sustained development and core competitiveness. Through analyzing Bao Gang's success, we hope it can give some reference to some developing enterprises.

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# The Application of Social Marketing in Reducing Road Traffic Accidents among Young Male Drivers: An Investigation Using Physical Fear Threat Appeals

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## Abstract

There were 338 road fatalities on Irish roads in 2007. Research in 2007 by the Road Safety Authority in Ireland states that young male drivers (17 – 25 years) are seven times more likely to be killed on Irish roads than other road users. The car driver fatality rate was found to be approximately 10 times higher for young male drivers than for female drivers in 2000. Young male drivers in particular demonstrate a high proclivity for risky driving behaviours. These risky behaviours include drink driving, speeding, drug-driving and engaging in aggressive driving. Speed is the single largest contributing factor to road deaths in Ireland. Approximately 40% of fatal accidents are caused by excessive or inappropriate speed. This study focuses on how dangerous driving behaviours may be addressed through social marketing. This study analyses the appropriate level of fear that needs to be induced in order to change young male driving behaviour.

**Keywords:** Young male driver, Speed, Drink driving, Social marketing, Physical fear appeals

## Background

Road safety is a vital public concern and one that affects each of us every day. We all have a social responsibility to ensure safety on our roads. The system of penalty points was introduced in Ireland in 2003 and this saw the lowest figure killed on Irish roads since 1964 (336 deaths in 2003). Figure 1 shows the dramatic improvement in fatal collisions in Ireland between 1972 and 2004. In 1973, there were over 600 people killed on Irish roads, 30 years later in 2003, this figure had dramatically declined to 336. Experience in 2007 shows that, keeping road deaths down remains a constant battle, but road deaths still managed to decline with 338 deaths in 2007, from 365 in 2006. This represents a significant improvement given the increasing volumes of traffic on Irish roads. In 1977, there were 748 000 registered vehicles on Irish roads - this had increased to 1.94 million in 2003 (NRA, 2004). The system of penalty points shows that driver behaviour can be changed. Road fatality figures fell to 338 fatalities on Irish roads in 2007 (Note 1). While fatality figures have been the primary focus of the media, many more people are injured on Irish roads. In 2006, there were 28,417 Garda (Note 2)-recorded traffic collisions resulting in 8 575 persons injured on Irish roads. If road statistics from 1961 - 2002 are examined it is found that, on average, for every life lost on Irish roads another 20 people are injured. Some of these injuries are severe, life altering injuries (RSA, 2007).

The EU has set itself a target to half the number of road deaths by 2010. Translating this EU objective into an Irish context by 2010 necessitates a 50% reduction in the 411 fatalities on Irish roads in 2001. Therefore, if Ireland is to achieve this objective it should have no more than 206 road fatalities per annum by 2010. This objective represents a massive challenge for road safety authorities. Figure 2 shows the road fatality trends from 2001 to 2005. Using 2001 as the starting base, the best performing countries have been Luxembourg, France, Sweden, the Netherlands, Belgium and Portugal. Ireland is ranked seventh in the EU for road fatalities. In 2001, the road fatality rate here was 108 per million. The UK had the lowest rate at 60, while Greece had the highest at 180 (European Transport Safety Council, 2006).

Speed is the single largest factor contributing to road deaths in Ireland. More than 40% of fatal accidents are caused by excessive or inappropriate speed. The higher the impact speed, the greater the likelihood of serious and fatal injury. For car occupants in a collision, with an impact speed of 80 km/h (50mph), the likelihood of death is about 20 times that at an impact speed of 30km/h (20mph). A 50km/h (30mph) impact is equivalent to dropping a car from the top of a two storey building. A 100km/h (60mph) impact is equivalent to dropping 11 storeys and a 150km/h (80mph) crash is equivalent to 30 storeys. Research and international experience show that the frequency

and severity of road crashes tend to decrease with reductions in average speed. A 1km/h decrease in average speed results typically in a 3% decrease in road crash frequency (NRA, 2004).

### **1. Young male drivers as a cause of concern**

Young drivers are generally regarded as a high risk road user group. They are more frequently involved in traffic accidents when compared to older drivers (Laapotti et al, 2001; Bjørnskau, 2000). Drivers under 25 years of age account for 27% of driver fatalities in the OECD (Note 3), despite representing only 10% of the population in these thirty countries (JTRC, 2006). In 2000, 34% of Irish road fatalities and 26% of all injury accidents were represented by young people aged between 16-25 years, despite these drivers representing only a small fraction of the Irish driving community. Young drivers' high involvement in road accidents can be attributed to a host of factors. These factors stem from social, physiological, psychological, cognitive and behavioural components which predispose young drivers to high road accident rates.

Figure 3 demonstrates the disproportionate number of young passengers killed in Ireland in 2003. This passenger fatality trend is longitudinal in nature and appears not only in Ireland but in road safety statistics worldwide. Teenagers and young males in particular have a high proclivity for risky behaviour, exemplified by drinking and driving, speeding, neglecting seat belts, risk taking while driving and night time driving. Recent research by the Road Safety Authority (2007) in Ireland states that young male drivers (17 – 25 years) are seven times more likely to be killed on Irish roads than other road users. Shope et al (1996) suggests that inexperience and risk taking are two factors that are strongly associated with young driver collisions.

Vernick et al (1999) found that the most important factor when evaluating driver risk is not driving skill but rather driver judgement. Driver judgement is often associated with age and experience. Benda and Hoyos (1983) investigated hazard perception among drivers. They found that inexperienced drivers utilised simple models which focused on individual variables. Inexperienced drivers typically only considered individual factors such as the weather and road layout etc. when appraising risk. However, more experienced drivers demonstrated a greater appreciation of the real risks present by taking a more holistic view of a driving situation. Young drivers tended to compartmentalise the risks and generally failed to appreciate the dangers involved.

The sensation seeking scale, first developed by Zuckerman (1979), has been used extensively in road safety research. Sensation seeking is seen as a personality trait of individuals who indulge in thrill seeking. According to Zuckerman (1994), sensation seeking is a trait that sees people accepting a variety of different possible risks in order to seek out and experience exciting and intense new sensations and events. The term sensation seeking refers to individual differences in optimal levels of arousal and stimulation, manifested as a character dimension.

Jonah et al (2001) conducted a study to explore the relationship between sensation seeking and risky or aggressive driving. High sensation seekers were found to be more prone to aggressive driving than low sensation seekers. Seatbelt wearing rates were lower among high sensation seekers than low sensation seekers. Crash involvement and traffic violations were found to be higher for high sensation seekers than for low sensation seekers. High sensation seekers were also found to be more likely to drink and drive in a number of situations. These results concurred with earlier work done by Jonah (1997) which explored the personality traits of risky drivers. This research found a strong correlation between individuals who displayed sensation seeking tendencies and those who were prone to risky driving.

Table 1 highlights the stark gender divide in terms of EU road fatalities between the sexes. The data in table 1 relate to 2002 but similar results are evidenced each year. In 2002, males account for 76% of all road fatalities in Ireland, with Ireland having one of the highest rates of road fatality levels among 16-25 year olds. Despite having a very high male fatality rate, Ireland has the lowest male fatality figure of the 14 EU countries but has the highest female fatality rate. Interestingly, Ireland has the lowest road fatality figure among 41-60 year olds. The data finds that male road users are between three and six times more likely to be killed than female road users (SafetyNet, 2004).

It is estimated that male drivers between 17 - 20 years of age have an average of 440 injury accidents per 100 million kilometres driven. This far exceeds the average injury accident rate of 106 injury accidents per 100 million kilometres for all male drivers. Young female drivers exhibit an injury accident rate of 240 injury accidents per 100 million kilometres. However female drivers as a whole only exhibit a rate of 100 injury accidents per 100 million kilometres driven (Forsyth, 1992a; Forsyth, 1992b). This statistical research demonstrates that young drivers are more likely to be involved in an injury accident than older drivers. It also highlights the fact that younger women drivers appear to be safer drivers than younger male drivers. In essence, this shows that young male drivers are the most accident prone drivers on the roads. The same trend is evident in Ireland as illustrated in table 1.

Young driver accidents tend to be more severe than accidents not involving young drivers, in terms of both the injuries sustained and the mortality rates involved. In 2000, the fatality rate (the number of drivers killed per

100,000 people) was much higher for those aged 18 - 24 years than for any other age cohort (NRA, 2000). A gender bias was also clearly evident. Male road user deaths occur predominantly among car users who accounted for 62% of Irish road deaths in 2004 (NRA, 2004). In 2000, young drivers accounted for 37% of all car drivers killed and 18% of car drivers injured despite representing only a small fraction of the driving community. Young driver accidents accounted for 26% of all injury accidents on Irish roads in 2000. The car driver fatality rate was approximately 10 times higher for young male drivers than for female drivers (NRA, 2000).

Drink driving is also an area of concern. The Garda estimate that alcohol is the primary causal factor in 25% of all Irish road collisions and accounts for roughly 33% of fatal collisions in Ireland (An Garda Siochana, 2005). However the National Safety Council estimate that alcohol accounts for 40% of road deaths and at least 30% of all road accidents in Ireland each year (DOHC, 2004). A review of surveys from various EU countries concluded that at any given time, between 1% and 3% of drivers are under the influence of alcohol while driving on EU roads (ETSC, 1995). These drink drivers account for 40% of all road fatalities in the EU. The research also suggests that in countries where anti drink driving enforcement is low, a reduction of up to 15% in road fatalities is achievable through increased anti drink driving enforcement activities. If Random Breath Testing levels were increased throughout the EU to the current EU average (1 breath test per 16 inhabitants) between 2 000 and 2 500 lives could be saved per year (ETSC, 1995).

Crash risk and mortality rates can be measured in risk curves. Risk curves are generally steeper for serious and fatal crashes, for single-vehicle crashes, for drink drivers and for young people (Zador, 1991; Jonah, 1986; Mayhew et al, 1981). Figure 4 demonstrates the relationship between age and the corresponding risks associated with varying BAC (Note 4) levels. Young people are most at risk after the consumption of alcohol due to their susceptibility to its intoxicating effects. This is chiefly due to biochemical considerations which find young people possessing a lower alcohol tolerance than older drivers. A variety of other factors such as muscle mass, speed of alcohol consumption, if the person has eaten prior to drinking, etc also dictate the level of intoxication. According to research by Zador et al (2000) cited by Bedford et al (2006), drivers over 35 years of age are 11.4 times more likely to be fatally injured in a crash when their blood alcohol levels ranged from 80mg/100ml (Irish legal limit) to 100mg/100ml. However for young drivers aged between 16 - 20 years, the relative risk of a fatal crash increases by 51.9 times when their BAC level is within the 80mg/100ml to 100mg/100ml BAC range.

According to Fuller (2005) high risk drivers represent 14% of the Irish driving population. Within this subgroup, 90% of the drivers are young male drivers. The mean age of these high risk drivers was found to be 26 years of age. From a road safety perspective the "high risk driver" group pose a number of problems for Irish road safety. High risk drivers are problematic because their driving behaviour is derived from their attitude. Unlike emotions, which are transitory in nature, attitudes prove more difficult to alter. Even if a change in attitude is achieved, behavioural change is by no means assured. Begg and Langley (2001) indicate that young drivers tend to "mature out" of risky driver behaviours at around 24 years of age. This trend could possibly be attributed to improved hazard recognition and better driver skills gained through driving experience.

## **2. Social Marketing/Communications Theoretical Framework**

The second half of the 20<sup>th</sup> Century witnessed the determined application of managerial techniques to social problems. In the field of marketing, a forceful argument was presented to the effect that the "marketing concept" – the successful postwar operating philosophy that emphasised the formation of marketing programmes based on perceived consumer needs, could be extended well beyond for-profit business organisations. A major offshoot of the "broadening" argument was the emergence of the concept of "social marketing" (Kotler and Zaltman, 1971). Social marketing refers to the application of basic marketing principles to the design and implementation of programmes and information campaigns that advance social causes such as alcohol misuse, drug prevention, traffic safety, etc.

Walsh et al (1993) used social marketing programmes to address the issues of excessive drinking, unhealthy diet, lack of exercise, or the use of tobacco, etc. Social marketing programmes have been designed to address a whole host of issues including alcohol and other drug problems on college campuses (Zimmerman, 1997) and traffic safety among broader communities (Hastings and Elliott, 1993).

The use of fear appeals is perhaps the most common tactic for social marketing, with threats of physical harm including injury and death used more frequently than social threats. One common problem with fear appeals aimed at young males aged 17-25 years is that they underestimate their own risk of injury (be that from excess drinking, smoking, drug use, unprotected sex or dangerous driving).

Grosvenor et al (1999) state that as with adults, adolescents' perceived certainty of punishment appears to be more of a deterrent for drinking and driving than perceived severity of punishment. They found no deterrent effect of

perceived severity of punishment on drinking and driving, suggesting that deterrence-based countermeasures should focus on increasing the likelihood of punishment for drinking and driving rather than increasing penalties.

Having evaluated the pros and cons of various channels of communication, Cameron and Harrison (1998) concluded that television is widely considered by experts to be the most persuasive medium for road safety campaigns. Television was found to be the most effective medium for conveying emotion. Research by Anderson (1978), Griep (1970) and Robertson et al (1972) has provided evidence to suggest that generic road safety campaigns are of limited benefit. Despite possibly increasing awareness levels, these types of road safety campaigns have proved an inefficient means of instigating behaviour change. Donovan et al (1995) contend that the specific demographics of the target audience should determine the campaign style and execution. They suggest that targeting the core motives of the intended audience is vital when producing an effective road safety advert. They also found that serious road safety adverts were more persuasive than those which tried to incorporate humour into their design. Furthermore, while an optimum level of threat could not be determined, the research did indicate that drama based adverts were more effective than lecture-style adverts. Following a review of PSA (Note 5)s, Dejong and Atkins (1995) concluded that PSAs targeting young people should portray adolescents of their own age (peers) in the advert. The PSA should also avoid any didactic undertones and instead focus on the social consequences of non compliance in safe driving.

Delhomme (1999) also indicated that road safety campaigns performed best when married with enforcement activities and undertaken in the presence of strong legislation. Under such conditions major reductions in both the number of collisions and the crash severity of accidents were found to materialise. While the effects of legislation alone could not be measured, the data did suggest that its impact was nominal unless supported by credible levels of enforcement. Delaney et al (2004) also found that legislation acting as the sole support for a media campaign is of little benefit. However, in its absence road safety campaigns have been found to be ineffective. Publicity campaigns in the US were found to be of little benefit in promoting seatbelt use until legislation made seatbelt wearing legally compulsory (Foss, 1989; Williams et al, 1987).

### 3. Methodology

This study focuses on young male Irish drivers and their attitudes towards speed, seat belt wearing, dangerous driving and drink-driving. Its main question is:

(1) Can social marketing have a role in reducing road traffic accidents among young male drivers?

The research objectives are as follows:

- (a) To investigate the reasons behind the high representation of young male drivers in Irish road fatality figures.
- (b) To investigate the effect on young male Irish drivers of fear appeals that focus on death and disability as a consequence of bad driver behaviour.
- (c) To investigate the effect of high physical fear advertisements on young male Irish driver attitudes.

Seven focus groups were conducted between April and May 2007. The focus groups were held in a lecture hall in Cork Institute of Technology, Cork, Ireland. This location facilitated the use of a large projector system which was used to screen the road safety films and safety advertisements shown in this study. The focus groups were recorded on audio tape to facilitate data collection and analysis. The focus groups typically lasted between 1.5 - 2 hours. All participants were young male drivers aged between 17 and 24 years of age (the target profile of the study). Focus group participants were full time students taking classes in the Automotive Department of Cork Institute of Technology. These students were chosen as it was judged that:

- a. They would possess a car.
- b. They fitted the profile of the study in terms of age and gender.
- c. They would have a high interest in cars and the transport sector in general.

Participants were firstly briefed on the purpose and research objectives of the study. From the outset participants were assured of their anonymity and encouraged to contribute their opinions without prejudice. Having introduced the topic, a 10 - 15 minute preliminary discussion was conducted to gather data on the driving history and driving behaviours of the participants. Having completed this discussion, participants were shown two films and national and international adverts relating to speeding, drink driving, and seatbelt wearing.

Focus group subjects were firstly shown two films from a Road Safety DVD produced by Radio Telefis Eireann (RTE – the Irish national broadcasting service). The two short films (12 minutes each) were shown to participants. The first film entitled “*Left Behind*” contains candid interviews with parents, children and close friends of those who have been killed in road accidents. The film clearly illustrates the heartbreak experienced by those “left behind”.

The second film, entitled “*Shattered Lives*” deals with the serious injuries suffered by young male drivers who have been in car crashes. The documentary contains a number of interviews with young, paralysed drivers by RTE’s chief news correspondent, Charlie Bird. This short film explores the stark realities of being paralysed and the resulting life changing consequences for both friends and family.

Participants were then asked to discuss both films and identify which film they found most persuasive. They were also asked to explain the rationale behind their evaluation of the films and the cognitive processes used to appraise the films.

#### 4. Results

It appears that the moral argument has been won in relation to seatbelt wearing, with participants in all focus groups accepting the necessity for both front and back seatbelt wearing. However, much work remains to be done in socially engineering young driver compliance with regard to drink driving and speeding. Advertising aimed at young drivers should focus on these areas. The focus groups revealed that speeding in particular is still very socially acceptable in Ireland. Road safety advertising should attempt to undermine the climate of acceptability that surrounds speeding in particular. Continuous and creative interventions are needed to proactively promote the highest possible overall levels of road safety. Given that road safety budgets are finite, it is important to produce adverts that are both relevant and credible to the target audience. Adverts must focus on the core motives of the target audience and take into account the perceptual landscape that young drivers inhabit.

Some of the current Irish road safety adverts were perceived by respondents as being visually impressive and highly dramatic but essentially “fake” and over the top. This lack of advert credibility is a barrier to attitude and behaviour change. Due to the dramatic crashes depicted in some adverts, young drivers are found to cognitively discredit the accuracy of the advert. The upward trend in producing increasingly shocking adverts appears to have tilted the balance of power away from the advertiser. If the advert is perceived as being “over the top”, then the integrity of the message contained in the advert is compromised. It is recommended that more research be conducted to ascertain what content young male drivers believe to be realistic and credible.

Drama based adverts that depict human pain and emotions such as remorse and guilt, have the potential to stimulate attitude change. The focus groups generally revealed that high threat advertising can be effective in hammering home a road safety message. However, they also found that high threat physical fear appeals cause some viewers distress. The focus groups produced evidence of defensive behaviours such as channel switching among respondents. This is a cause for concern.

More research should be done on segmenting the young male driver profile so that high risk individuals can be targeted. Not all young male drivers are dangerous drivers. More research should also be done on investigating the effectiveness of moderate fear appeals which may not stimulate the same level of defensive cognitive behaviours. However, it is unknown if adverts containing a moderate fear appeal have the same capacity for attitude change as those which contain a strong fear appeal, if all other variables are equal within an Irish context. The authors recommend that high threat road safety advertising should continue. However, this recommendation is contingent upon a more thorough analysis of target group perception and cognitive value systems being undertaken. Ensuring that road safety advertising is credible and realistic should take precedence over considerations relating to the levels of threat contained in the advertising.

One way of assessing the best content for road safety adverts is to open the communication channels between advertisers and young male drivers. The Transport Accident Commission (TAC) in Australia run competitions which give young people the opportunity to submit their ideas for road safety adverts. Competition entrants are given a brief and asked to design an effective road safety advert. The winning advert is then produced by the TAC for television audiences. The “*Make a Film, Make a Difference*” competition is an example of harnessing the creativity of the target audience to overcome the perceptual problems associated with road safety advertising (Note 6).

The data from the focus groups suggest that the content of road safety campaigns should focus on serious injuries rather than death. Adverts depicting seriously injured or wheelchair bound drivers are found to be highly effective in provoking cognition among young drivers. The focus groups established that road safety communications which depicted serious injuries were much more potent than those which depicted driver death. Road safety adverts aimed at young male drivers should also highlight the threat of killing or seriously injuring friends as a consequence of dangerous driving activities. Young men appeared to place an especially high value on the lives of their friends and family.

The data suggest that the fear associated with their own mortality is not as great as the fear of being responsible for killing or seriously injuring a friend. Adverts which stimulate feelings of guilt and remorse have been found to be

associated with high levels of persuasion. Such adverts need to graphically depict the effects of errant driver behaviour on others in order for them to be effective.

Lecture-style road safety adverts which highlight the dangers of errant driver behaviours such as speeding and drink driving were sometimes found to stimulate defensive cognitive processes. Some drivers were found to display scepticism at the claims made by these lecture-style adverts. Defensive cognitive processes were found to limit the effectiveness of these types of adverts. However, the majority of focus group participants did believe that these types of adverts could be effective if they were used in conjunction with dramatic, high threat road safety advertising.

Driver expectation of enforcement levels are influenced by advertising. The effective marriage of enforcement and advertising interventions permits the generation of synergies which can result in dramatic road fatality reductions. However, such gains are unlikely to be sustained in the long term if enforcement levels do not match the threat communicated by adverts. Advertising that stresses the threat of enforcement should be avoided until the level of enforcement displayed in adverts can be matched by the police presence on the roads. The threat of anti drink driving enforcement activities is not credible for many drivers in rural Ireland. Enforcement focused adverts may well prove to be effective in urban areas where enforcement levels are high. It is hypothesised that the drop in road fatalities in 2003 is attributable to the roll out of the penalty points system and the heavy promotional campaign that accompanied it. Enforcement levels need to be stepped up in rural areas. The gradual increase in Garda Traffic Corps numbers should help in this regard but the lack of late night transport links in rural areas is a central issue to Irish road safety which needs to be tackled. This problem can only be addressed through the cooperative efforts of all stakeholders.

High threat advertising generally appears to be effective in provoking attitude change. However, nearly half of the participants were found to have turned over the television channel, when a high threat advert appeared on the television. This finding is worrying. It is recommended that extensive quantitative research be undertaken to determine if cognitive level defensive systems are at this high level among the target group.

High threat adverts have served Irish road authorities well in recent years and they continue to make a positive contribution to Irish road safety. It is recommended that high threat advertising should continue in Ireland until substantive quantitative data can be gathered on target group defensive mechanisms. This research should be undertaken as a matter of urgency. A more thorough appraisal of moderate fear appeals is also recommended.

Television and cinema adverts can undoubtedly be effective in stimulating attitude change. However, in-car communications such as radio advertising perhaps merits more attention. Focus group participants mentioned adverts from "Red FM (Note 7)" which they considered to be persuasive. Other in-car communications such as signs and stickers on the steering wheel or on a key ring could also be used as a cognitive trigger to remind motorists to drive safely. However, as yet, there is a lack of research in this area. More research is needed to assess the effectiveness of in-car ambient advertising.

## **5. Other Communication Methods**

The data from this study suggest that there should be a move towards other methods to communicate with young drivers. The need to win the hearts and minds of young drivers dictates that communication efforts should be expanded beyond the confines of traditional marketing channels. Evidence from the focus groups suggest that positioning crashed cars outside rural night clubs may be effective in making people think twice about drink driving. The focus groups revealed that seeing the actual effects of crashes on vehicles is a "real eye-opener". This type of communication would conceivably bypass many of the cognitive defensive mechanisms employed by young drivers who attempt to minimise the threat in other road safety communications. Young drivers would not be able to minimise the threat by suggesting creative license on the part of the advertisers. Neither would the young drivers be able to minimise the threat by switching over to another channel. The communication would send a message to drivers close to the time when a decision has to be made on how to get home. The close chronological proximity of the communication to the decision making moment may positively influence the captive audience when making plans to get home. However, it is also likely that this method of communication may distress some people.

Focus group participants also recommended a more hands on approach to advertising. They suggested that road safety presentations should be rolled out nationally to all secondary schools. Some of the material shown in the focus groups (the RTE documentaries) is being sent to secondary schools for inclusion in the Transition year (Note 8) syllabus. However, focus group members contended that all secondary students should view this material given that driving is an essential life skill that they will all have to learn. Some respondents contended that high speed driving is an activity that is learned over time. Many of the respondents interviewed began driving at 12 and

13 years of age. Focus group participants indicated that early interventions which promoted safe driving were therefore necessary in order to tackle the problem of speeding among young drivers.

Overall, focus group participants identified “traffic informers” as the most credible and consequently the most effective road safety communication medium available to road safety experts. The use of “traffic informers” and “road shows” are a new trend that has recently emerged in threat based social marketing. “Traffic informers” are crash casualties who have been severely and permanently injured in a road crash. These young “traffic informers” give presentations to secondary school students on the circumstances surrounding their crash and the knock on effects it has had on them and their families. This type of presentation is similar to the presentation shown in the documentary “*Shattered Lives*” which was shown in the focus groups. The results of this study suggest that this type of road safety communication is the most effective method of stimulating attitude change in young drivers. This type of communication again pre-empts many of the cognitive defence strategies that can be employed by young drivers in response to media communications. The use of “traffic informers” in adverts and short films was thought to be highly effective. The candid honesty of the “traffic informers” meant that these presentations were perceived as being highly credible.

However, it is hypothesised that the effects on young drivers of actually viewing a real life presentation by a “traffic informer” would produce even better results. It should be noted that these presentations are typically much longer than road safety adverts. It is not known if a certain time threshold needs to be crossed for a “traffic informer” advertisement to be effective. Due to the necessity of such a presentation to solicit empathy in order to be effective, it is questionable if a 60 or even 90 second advertising slot could effectively produce this effect. For this reason the role of short, snappy television adverts is assured. However, such adverts cannot offer the same level of emotional engagement as “traffic informer” presentations. The authors recommend the widespread use of “traffic informer” presentations in secondary schools across the country. These presentations could be shown to classes by means of a television or possibly even incorporated into a live, travelling road show where real life traffic informers actually visit the school. Road safety shows could also incorporate theatrical productions which might help to engage the audience via viewer participation.

Research investigating the effectiveness of one such road show entitled “*Never Saw the Day*” revealed that the core message of the show (road crashes have severe consequences) was effectively communicated to viewers. The British road show produced attitude change in viewers that was found to last up to a year. The research also found that people who had experienced the road show were also more receptive to future road safety campaigns (Vlakveld, 2005).

Road shows could also be used in conjunction with more traditional advertising channels to reinforce and accentuate the effects of social marketing communications. Whether the effects of a real life presentation by a “traffic informer” at a road show is more convincing than an audio visual presentation is unknown. This is an important research question that must yet be answered. More research into this area is advised. It is posited that the addition of these hybrid communication channels into the social marketing mix could provide an integrated communications package that would significantly reduce young male driver road deaths and injuries.

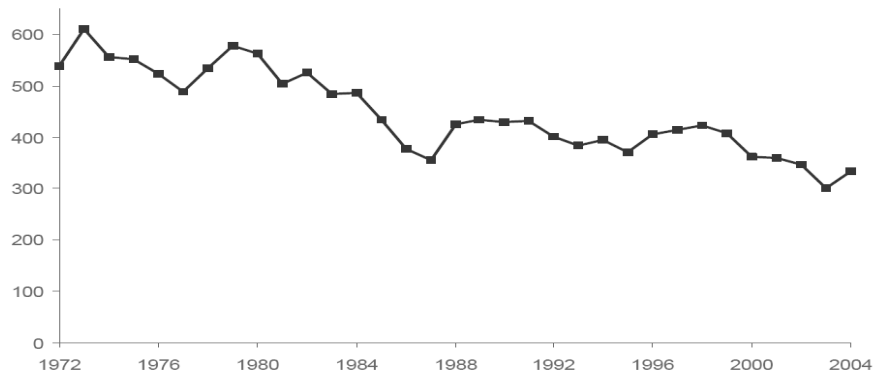
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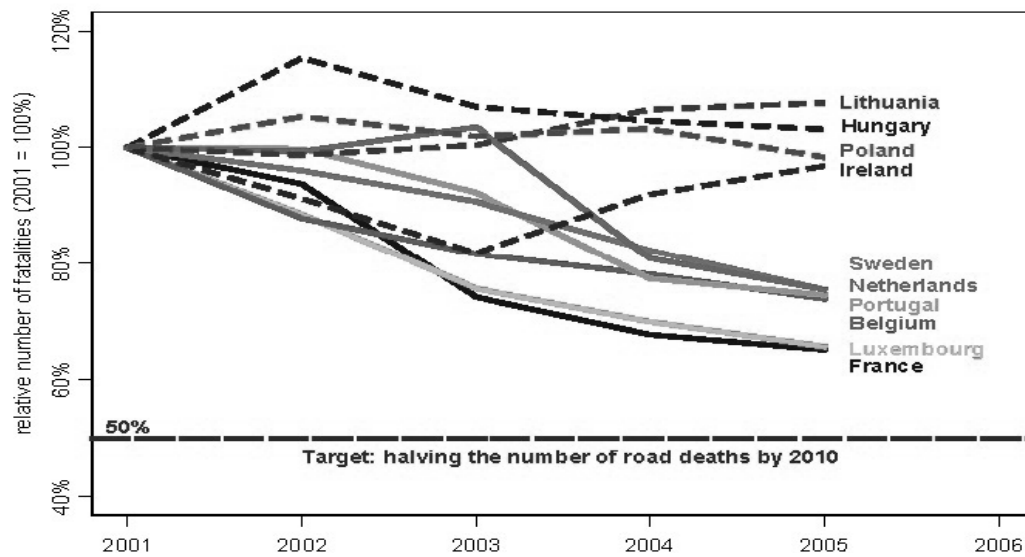
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- Notes**
- Note 1. [http://www.garda.ie/statistics98/rtastats\\_longterm.html](http://www.garda.ie/statistics98/rtastats_longterm.html) [11/02/08]
- Note 2. Irish Police
- Note 3. Organisation for Economic Co-operation and Development.
- Note 4. Blood Alcohol Concentration
- Note 5. Public Service Announcements
- Note 6. <http://www.mafmad.com.au> [05/04/07]
- Note 7. Local radio station in Cork aimed at the younger demographic
- Note 8. This is typically the fourth year in the six year secondary cycle.



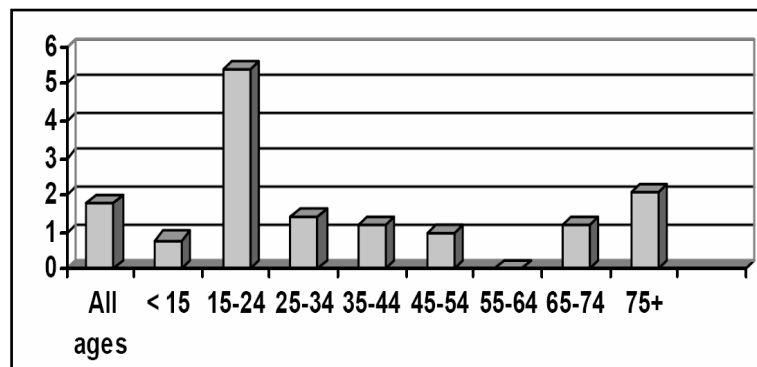
Source: National Roads Authority, 2004

Figure 1. Fatal collisions in Ireland 1972 – 2004



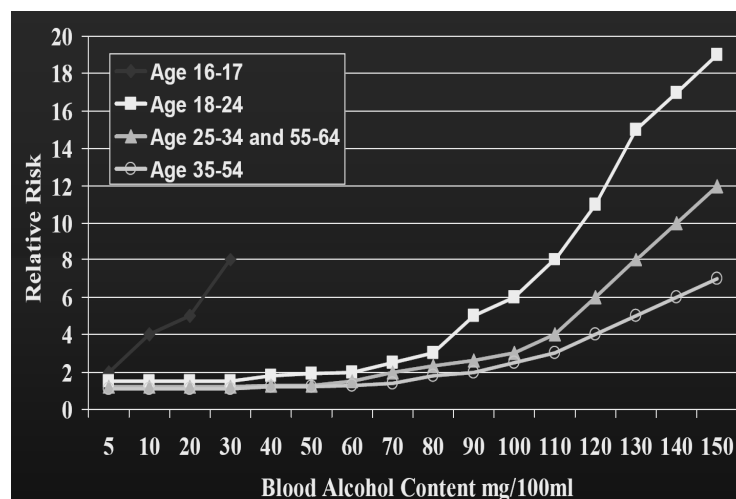
Source: European Transport Safety Council, 2006

Figure 2. Road fatality trends within the EU 2001 – 2005



Source: Bedford et al, 2006

Figure 3. Irish mortality rates (per 100,000 citizens) for passengers in 2003



Source: Crowley, 2006

Figure 4. Accident risk by blood alcohol level and driver age

	16-25	26-40	41-60	61-99	Female	Male
Belgium*	26%	34%	24%	17%	21%	79%
Denmark	22%	35%	21%	22%	21%	79%
Greece*	20%	34%	31%	16%	8%	92%
Spain	22%	36%	27%	15%	14%	86%
France	28%	29%	25%	19%	22%	78%
Ireland	27%	35%	17%	20%	24%	76%
Italy**	23%	32%	25%	20%	15%	85%
Luxembourg	13%	53%	29%	5%	16%	84%
Netherlands	34%	27%	22%	16%	19%	81%
Austria	31%	28%	23%	18%	21%	79%
Portugal	24%	37%	26%	14%	15%	85%
Finland	23%	22%	32%	22%	19%	81%
Sweden	21%	23%	29%	27%	15%	85%
UK	31%	29%	21%	19%	23%	77%
Total	26%	31%	25%	18%	18%	82%

\* Data from 2001

\*\* Data from 1998

Source: CARE Database / EC

Date of query: February 2005

Source: SafetyNet, 2004

Table 1. Road fatalities in member states by gender and age in 2002

# The Risk Study and Control in Investment Decision

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## Abstract

We give the descriptions of the concepts of investment and risk related to investment first. Then, we consider how to measure the rates of return and the risk for alternative investments, and what factors determine an investor's required rate of return on an investment in the second section. In order to control the risk systematically, the portfolio control process is proposed in section 3. Section 4 describes in detail the three major composite equity portfolio performance measures that combine risk and return performance into a single value. We describe each measure and its intent, and then demonstrate how to compute it and interpret the results. We also compare two of the measures and discuss how they differ and why they rank portfolios differently. The real application on the risk study and control in investment is discussed at the end.

**Keywords:** Investment, Risk Control, Modeling, Decision Making, Portfolio

## 1. Introduction

With the progress of global economy and the development of information technology, Investment Analysis and Management (IAM) is becoming more and more important in enterprise strategy management. An important purpose of the IAM is to help an entity to integrate information from a variety of sources and to integrate their efforts to solve the global investment problem. The information resources, which many include databases, decision models and knowledge bases, will be shared by several users, many of them responsible for one aspect of an overall decision problem. Modeling and analyzing is the corn of the IAM and the research on the investment risk and return is the first thing to deal.

This section discusses several topics that are basic to subsequent sections. We begin with a consideration of what are investment and the risks related to investment. This leads to a presentation of how to measure the expected and historical rates of return for an individual asset or a portfolio of assets. In addition, we consider how to measure the risk not only for an individual investment, but also for an investment that is part of a portfolio.

Specifically, an **investment** is the current commitment of dollars for a period of time to derive future payments that will compensate the investor for the time the funds are committed, the expected rate of inflation, and the uncertainty of the future payments (Aswath, 1999). In all cases, the investor is trading a known dollar amount today for some expected future stream of payments that will be greater than the current outlay. At this point, **Risk** is the uncertainty that an investment will earn its expected rate of return. Risk, in traditional terms, is viewed as a "negative." Webster's dictionary, for instance, defines risk as "exposing to danger or hazard." The Chinese symbols for risk, reproduced below, give a much better description of risk: the first symbol is for "danger," while the second symbol is for "opportunity," making risk a mix of danger and opportunity. It illustrates very clearly the tradeoff that every investor and business has to make between the "higher rewards" that potentially come with the opportunity and the "higher risk" that has to be borne as a consequence of the danger. The key test in finance is to ensure that when an investor is exposed to risk he or she is "appropriately" rewarded for taking this risk.

## 2. The Models for Measuring Risk

In this section, we shall lay the foundations for analyzing risk in corporate finance and present alternative models for measuring risk and converting these risk measures into "acceptable" hurdle rates.

### 2.1 A Relative measure of risk

We can calculate the expected rate of return and evaluate the uncertainty, or risk, of an investment by identifying the range of possible returns from that investment and assigning each possible return a weight based on the probability that it will occur. A relative measure of risk that is widely used is the **Coefficient of Variation**, which is equal to  $CV = \frac{\sigma}{E(R)}$ . Where  $CV$  expresses Coefficient of Variation,  $\sigma$  is the Standard Deviation of Returns, and  $E(R)$  means the Expected Rate of Return.

## 2.2 Required Rate of Return (RRR)

We continue our consideration of factors that must consider when selecting securities for an investment portfolio. Required rate of return is the minimum rate of return that you should accept from an investment to compensate you for deferring consumption. Because differences in yields result from the risk of each investment, you must understand the risk factors that affect the required rate of return and include them in your assessment of investment opportunities. Figure 1 graphs the expected relationship between risk and return.

**RFR** (Risk-free Rate) is the basic interest rate, assuming no inflation and no uncertainty about future flows. The risk-free rate of interest is the price charged for the certain exchange between current goods and future goods. Two factors, one subjective and one objective, influence this exchange price. The subjective factor is the time preference of individuals for the consumption of income. The objective factor that influences the risk-free rate is the set of investment opportunities available in the economy. The investment opportunities are determined in turn by the long-run real growth rate of the economy. A positive relationship exists between the real growth rate in the economy and the RFR.

Most investors require higher rates of return on investments to compensate for any uncertainty. The slope of the security market line indicates the return per unit of risk required by all investors. Assuming a straight line, it is possible to select any point on the SML and compute RRR through the RP (Risk Premium). The equation is  $RRR = RFR + RP$ .

Although the required risk premium represents a composite of all uncertainty, it is possible to consider several fundamental sources of uncertainty. The major sources include business risk, financial risk, liquidity risk, exchange rate risk, and country risk.

## 2.3 Regression Model

The model above begins by thinking about market in broad intuitive terms and then developing economic model that might best explain this market risk. The regression model try to explain differences in returns across long time periods using firm characteristics such as the size of the firm and its price multiples. The firm characteristics that best explain differences in returns can be viewed as effective proxies for market risk.

Fama and French (Fama and French, 1992, pp. 427-466), in a highly influential study of the capital asset pricing model in the early 1990's, note that actual return on firms over long time periods have been highly correlated with their price/book value ratios and their market capitalization. They suggest that these measures, and similar ones developed from the data, be used as proxies for risk and that the regression coefficients be used to estimate required returns for investments. For instance, Fama and French report the following regression for monthly returns on stocks on the NYSE, using data from 1963 to 1990:

$$RRR = 1.77\% - 0.11\ln(MV) + 0.35\ln(BV/MV)$$

Where  $MV$  is the Market value of equity,  $BV$  means the Book value of equity (in million). The values for  $MV$  and  $BV/MV$  for individual firm should yield required monthly returns when them plugged into the regression.

## 3. The Portfolio Control Process

The first step in the portfolio control, as seen in Figure 2, is for the investor to construct a policy statement. The policy statement specifies the types of risks the investor is willing to take and his or her investment goals and constraints. Since investor needs change over time, the policy statement must be periodically reviewed and updated (Frank and Brown, 1997. Bhatia, 1990)

In the second step of the portfolio control process, the investor studies current financial and economic conditions and attempts to forecast future trends. Because economies are dynamic, the portfolio will have to be constantly monitored and updated to include asset reallocations to reflect changes in financial market expectations.

The third step of the portfolio control process is to construct the portfolio. This involves constructing a portfolio that will minimize the investor's risks while meeting the return needs specified in the policy statement.

The fourth step of the portfolio control process is to continually monitor the investor's needs and capital market conditions. When necessary, an updated policy statement is written and the investment strategy is modified accordingly. A component of the monitoring process is to evaluate a portfolio's performance and compare the results to the expectations and requirements as specified in the policy statement. The evaluation of portfolio performance is discussed in the section 4.

## 4. The Evaluation of Performance

At one time, investors evaluated portfolio performance almost entirely on the basis of the rate of return. They were

aware of the concept of risk, but did not know how to quantify or measure it, so they could not consider it explicitly. Developments in portfolio theory in the early 1960's showed investors how to quantify and measure risk in terms of the variability of returns. Still, because no single measure combined both return and risk before 1960's, the two factors had to be considered separately as researcher had done in several early studies (Irwin, Marshall, and Jean, 1970).

This section describes in detail the three major composite equity portfolio performance measures that combine risk and return performance into a single value. We describe each measure and its intent, and then demonstrate how to compute it and interpret the results. We also compare two of the measures and discuss how they differ and why they rank portfolios differently.

#### 4.1 The Systematic Risk Measure

Building on developments in capital market theory, a risk-free asset, which could be combined with different portfolios to form a straight portfolio possibility line, was introduced by Treynor (Jack L, 1965, pp. 63-75). The rational, risk-averse investors would always prefer portfolio possibility lines with larger slopes because such high-slope lines would place investors on higher indifference curves. The slope of this portfolio possibility line (designated  $S$ ) is equal to:

$$S = \frac{\overline{RR}_i - \overline{RFR}}{\beta_i}.$$

Where  $\overline{RR}_i$  is the average rate of return for portfolio  $i$  during a specified period,  $\overline{RFR}$  is the average rate of return on a risk-free during the same period, and  $\beta_i$  is the slope of the fund's characteristic line.

As noted, a larger  $S$  value indicates a larger slope and a better portfolio for all investors (regardless of their risk preferences). It indicates the portfolio's risk premium return per unit of risk. Note that the risk variable beta measures systematic risk and tells us nothing about the diversification of the portfolio. It implicitly assumes a completely diversified portfolio, which means that systematic risk is the relevant risk measure.

Comparing a portfolio's  $S$  value to a similar measure for the market portfolio indicates whether the portfolio would plot above the SML. Calculate the  $S$  value for the aggregate market as follows:

$$S_m = \frac{\overline{RR}_m - \overline{RFR}}{\beta_m}.$$

In this expression,  $\beta_m$  equals 1.0 (the market's beta) and indicates the slope of the SML. Therefore, a portfolio with a higher  $S$  value than the market portfolio plots above the SML, indicating superior risk-adjusted performance.

Figure 3 is showing that portfolio  $X$  not only ranked the lowest of the three portfolios, but did not perform as well as the aggregate market. In contrast, both  $Y$  and  $Z$  beat the market portfolio, and  $Z$  performed somewhat better than  $Y$ .

#### 4.2 The standard deviation Measure

The measure (Frank and Brown, 1997) of portfolio performance is stated as  $S = \frac{\overline{RR}_i - \overline{RFR}}{\sigma_i}$ . This composite measure of portfolio performance clearly is similar to the first one; however, it seeks to measure the total risk of the portfolio by including the standard deviation of returns rather than considering only the systematic risk summarized by beta. Because the numerator is the portfolio's risk premium, this measure indicates the risk premium return earned per unit of total risk. In terms of capital market theory, this portfolio performance measure uses total risk to compare portfolios to the capital market line (CML).

Figure 4 is showing that portfolio  $X$  had the lowest risk premium return per unit of total risk, failing even to perform as well as the aggregate market. In contrast, both  $Y$  and  $Z$  performed better than the aggregate market. The portfolio  $Y$  did better than portfolio  $Z$ .

#### 4.3 The Expected Return Measure

The measure (Frank and Brown, 1997) of portfolio performance is stated as  $E(R_j) = RFR + \beta_j[E(R_m) - RFR]$ . Where  $E(R_j)$  means the expected return on security or portfolio  $j$ ,  $\beta_j$  is the systematic risk (beta) for security or portfolio  $j$ ,  $E(R_m)$  is the expected return on the market portfolio of risky assets. The expected return and the risk-free return vary for different periods. Consequently, we are concerned with the time series of expected rates of return for security or portfolio  $j$ . Moreover, assuming the asset-pricing model is empirically valid, you can express the expectations formula in terms of realized rates of return as follows:

$$R_{jt} = RFR_t + \beta_j [R_{mt} - RFR_t] + U_{jt}.$$

This equation states that the realized rate of return on a security or portfolio during a given period should be a linear function of the risk-free rate of return during the same period, plus a risk premium that depends on the systematic risk of the security or portfolio during the period plus a random error term. Subtracting the risk-free return from both sides, we have

$$R_{jt} - RFR_t = \beta_j [R_{mt} - RFR_t] + U_{jt}.$$

This shows that the risk premium earned on the  $j$ th portfolio is equal to  $\beta_j$  times a market risk premium plus a random error term. In this form, an intercept for the regression is not expected if all assets and portfolio were in equilibrium.

Alternatively, superior portfolio manager who forecast market turns or consistently select undervalued securities earn higher risk premiums than those implied by this model. To detect and measure this superior performance, you have to allow for an intercept (a nonzero constant) that measures any positive or negative difference from the model. With an intercept or nonzero constant, the earlier equation becomes

$$R_{jt} - RFR_t = \alpha_j + \beta_j [R_{mt} - RFR_t] + U_{jt}.$$

In this equation, the  $\alpha_j$  value indicates whether the portfolio manager is superior or inferior in market timing and/or stock selection. Therefore, the  $\alpha_j$  value represents how much of the rate of return on the portfolio is attributable to the manager's ability to derive above-average return adjusted for risk. Superior risk-adjusted returns indicate that the manager is good at either predicting market turns, or selecting undervalued issues for the portfolio, or both.

All of the performance measures just described are only as good as their data inputs. You must be careful when computing the rates of return to take proper account of all inflows and outflows. Theoretically, the market portfolio is an efficient, completely diversified portfolio because it is on the efficient frontier. We also noted that this market portfolio must contain all risky assets in the economy, so that it will be completely diversified, and that all components are market value weighted. The problem arises in finding a realistic proxy for this theoretical market portfolio. While the Standard & Poor's 500 Index is used as the proxy in practice, but it does not represent the true composition of the market portfolio. Specifically, it includes only common stocks and most of them are listed on the NYSE. This lack of completeness, known as a benchmark error, is highlighted with global investing. Several points are significant regarding this benchmark criticism. First, the benchmark problems do not negate the value of the capital asset pricing model (CAPM) as a normative model of equilibrium pricing; the theory is still viable. The problem is one of measurement when using the theory to evaluate portfolio performance. You need to find a better proxy for the market portfolio or to adjust measured performance for benchmark errors. In fact, Roll made several suggestions to help overcome this problem (Richard, 1981. pp. 17-22). Alternatively, you might consider giving greater weight to the standard deviation measure because it does not depend heavily on the market portfolio.

In summary, because of a growing desire to evaluate aggregate performance and identify what factors contribute to superior or inferior performance, benchmark must be selected at two levels: a global level that contains the broadest mix of risky assets available from around the world and a fairly specific level consistent with the management style of an individual money manager.

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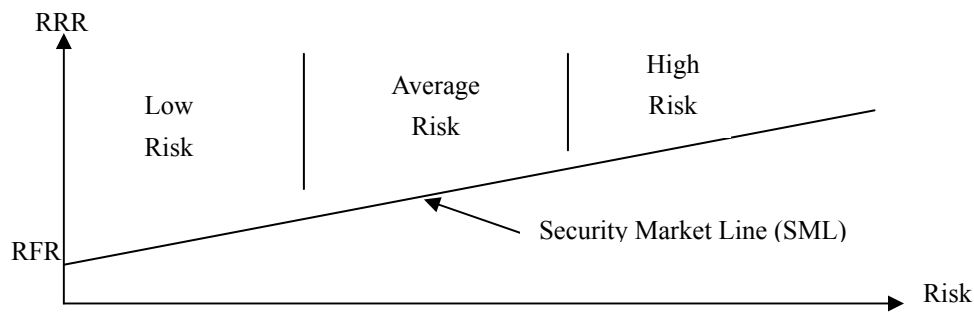


Figure 1. Relationship Between Risk and Return

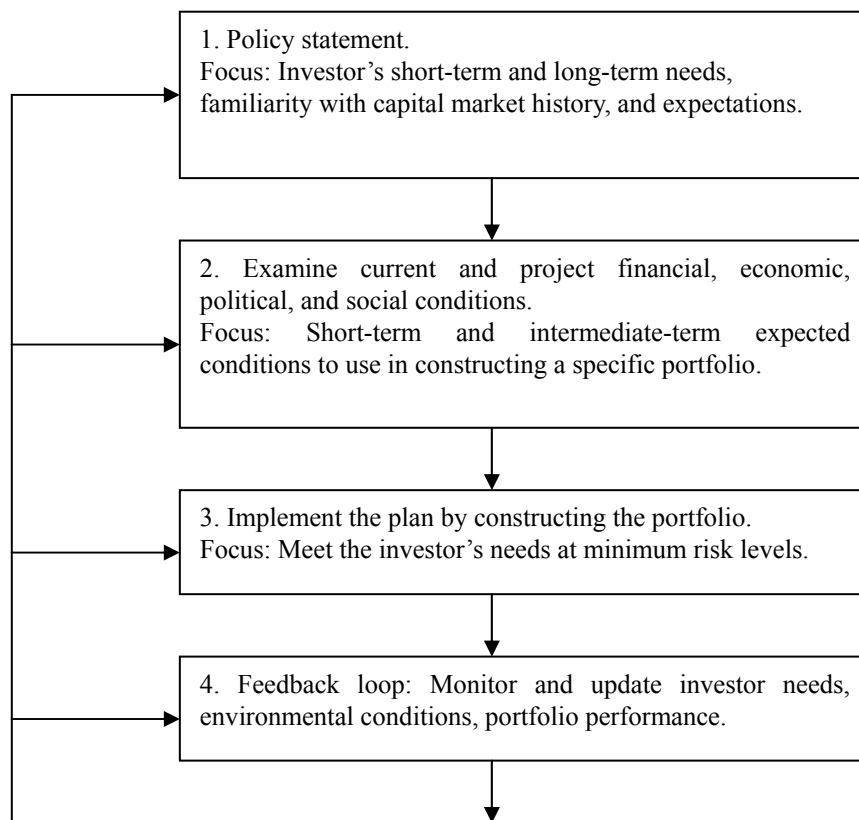


Figure 2. The Portfolio Control Process

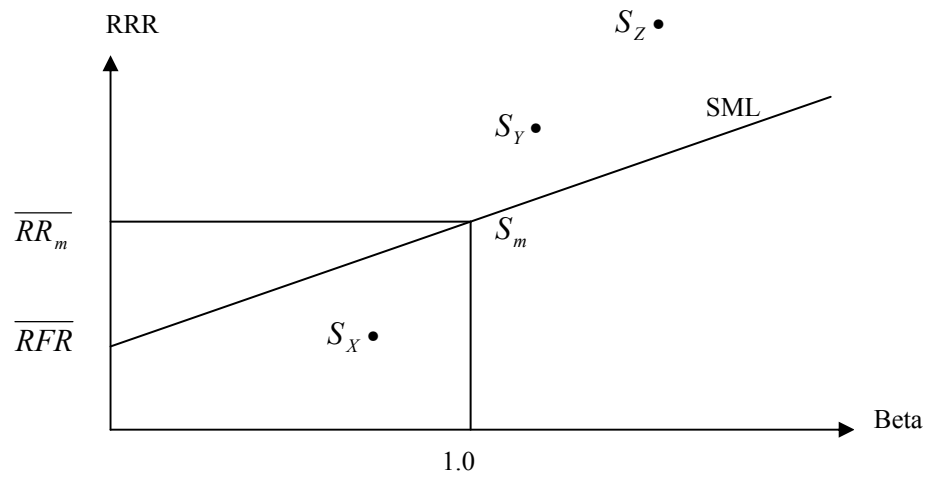


Figure 3. Plot of Performance on SML

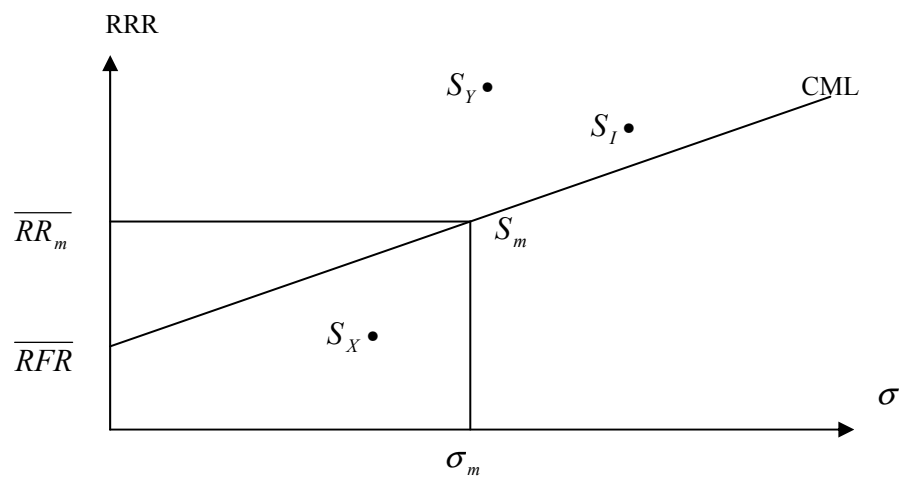


Figure 4. Plot of Performance On CML

# A Study on the Trans-Culture Management of International Hotel in China

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## Abstract

Along with the integration process of global economy, cultural conflicts gains more and more attentions. After China's entry to WTO, China economy is involved in world economy further. More and more international companies enter China. However, they encounter with an overall cultural impact. Trans-culture conflicts have already become a problem for international groups. Teams with different cultural beliefs challenge the effectiveness of traditional management theories. Differences between Chinese culture and western culture affect international groups' management significantly. Trans-culture management gains attentions from international groups more and more. Therefore, it is meaningful to research this issue. This paper selects the international hotel industry in China as a subject to study the trans-culture conflict phenomenon with the hope of achieving effective trans-culture management.

**Keywords:** International hotel group, Trans-culture management

## 1. Analyze the effect of culture from different levels of international hotel group

### 1.1 Founders

Many companies have their "heroes". Wilkins defines these people as "living or passing, real or virtual men who are models of behaviors in companies because of their widely-praising characteristics". Hotel industry is not an exception. It has lots of men of the time, such as Bill Marriot, Kemmons Wilson, and Conrad Hilton. They have high reputations in hotel groups. Their nationalities, experiences, and other cultural backgrounds directly affect companies' value judgments and value systems. Take Hilton Hotels Corporation for example, as a authentic American, the founder, Conrad Hilton describes its each hotel as "a small America, where all people from different countries can speak anything as they like". Every detail in the hotel, from design of building, advertising, and public relationship, reflects this democratic and friendly culture.

### 1.2 Top administrative managers

Along with the continuous development and growth of international hotel groups, many top administrative managers with different cultural backgrounds join in the management levels, what brings about new multi-cultural impacts on the international hotel groups. Because of different cultural and national backgrounds, these top administrative managers hold different philosophy of management, and different recognition to companies' organizational structure design and decision process. Decision-makers' different industrial backgrounds will affect their decision-making ways and management styles, what will inevitably generate cross-industrial impacts. On the other hand, hotel management has its uniqueness. Rich experiences are relatively more important. And internal promotion can benefit the reduction of management errors. However, more and more top managers are coming from other industries, what will cause more cross-industrial impacts on hotel groups. Many top administrative managers join in the management level by different professional ways, such as human resources or financial branch. These professional backgrounds will inversely affect their strategic choice.

### 1.3 Regional levels

International hotel groups usually partition their regional branches based on geographical locations. At this level, culture can still exert effects on companies, reflected mainly by the conflicts and integration between companies' mother culture and local culture and sub-culture. Different national culture backgrounds mean different value orientations and even different understandings to the term of "management". Corporate management is a kind of culture in essence. Drucker, a management scientist in America, connects management with culture clearly in his book "Management". In his opinion, management is not only a science but also a culture, with its values, beliefs, tools, and languages. Management culture is a part of common culture. It is an organizational culture and belongs to the scope of sub-culture. The management thoughts, management philosophy, and management system contained by management culture are undoubtedly restrained by specific culture instead of being generated from nothing.

#### *1.4 Interior of each hotel*

In every hotel of the groups, national culture possesses the dominant position, which influences hotel's operations directly. In specific, its influences focus on the cultural effects on employees and customers. Studies show that national culture's effects on employees are stronger than organizational effects. Chinese employees in international hotels are affected more by Chinese culture than by hotel groups' corporate culture. It means national culture can generate greater effects on management practices comparing with organizational culture. Therefore, employees in the hotel will be enslaved to national culture. They can bring about the company with "the popular culture and value orientation in their society". Because of different influences of national cultures, employees hold different ideas of time, labor habits, and work attitudes. Because of different cultural backgrounds, customers are in favor of different hotel services. Hotels should study customers' cultural orientations in target market and provide with right products for customers.

### **2. The necessities of implementing trans-culture management in international hotel group**

In the international hotel group, Chinese employees and western employees may come across these problems as follow in communication and cooperation.

(1) Extreme conservative. Chinese employees and western employees can not realize a mutual understanding toward others' politics, economy, laws, especially hotel culture and management way. The cultural sensitiveness between them is poor. And the relationship between them is tense. Foreign managers control the operation of hotels merely based on rules and regulations, which makes them separate from employees further. And the psychological distance between them is enlarged. The integration between Chinese employees and western employees is very difficult. In order to achieve trans-culture management, the two parts should reach compromises in specific issues and find out solutions. And these compromises may lead to more complex processes.

(2) Interruption of communication. The large psychological distance between Chinese employees and western employees will affect communication. As this distance reaches certain degree, the communication from the top to the bottom will be interrupted. The degree of work tense will rise. Meanwhile, different understandings or misunderstandings to leaders' intentions and work targets, and complete copy of foreign mode will cause the decrease of hotel's operation efficiency.

(3) Non-rational response. Chinese employees and western employees do not prepare completely for potential problems in cooperation. Their adapting abilities of culture and techniques of solving cultural conflicts are poor.

(4) Hating. Once a conflict appears, if Chinese employees and western employees complain others' impertinence or conservativeness instead of looking for commonness from others' cultural backgrounds, it will result in a widely hating in hotel.

The necessities of implementing trans-culture management in one international hotel group:

The so-called trans-culture management, also named as cross-culture management, refers to the management of people, materials, and affairs concerning different cultural backgrounds. In other words, it means how to overcome trans-cultural conflicts and realize effective management with the trans-culture condition. It aims at designing feasible organization structure and management mechanism in an environment with different cultures, achieving rational allocation of corporate resources, mining and using potentials and values of human resources as much as possible, and improving corporate comprehensive effect to a maximum degree. A famous American scholar points out "failures of multi-national companies are mostly originated from the neglect over cultural differences, primary or slight understandings". In order to achieve healthy development in China, international hotel group must implement effective trans-culture management. The key is to avoid the transformation from cultural difference to cultural conflict, solving present cultural conflicts as much as possible, and achieving operational targets, based on recognizing and distinguishing the cultural differences of Chinese hotels and western hotels.

#### *2.1 The essence of trans-culture management*

In researching companies' trans-culture management, cultural differences can affect management, but the effects are not necessarily negative. Cultural conflict refers to a mutual opposite process between different cultures or cultural elements. In a word, as cultural difference is free from reasonable control or management, it will cause a fierce rivalry that is reflected by cultural rub. Cultural conflict can hurt management efficiency. But we can escape from it. Therefore, it is not necessary for an international hotel group to change cultural differences in organizations. Inversely, the proper use of cultural difference may generate unexpected effects.

To sum up, the essence of trans-culture management can be summarized as using and controlling cultural difference, avoiding the transformation from difference to conflict, eliminating present cultural conflicts, and improving management efficiency.

## *2.2 Trans-culture management's procedures and measures*

The first step is the understanding of trans-culture. It includes two aspects. To understand other cultures, the first is to understand own culture. Secondly, understand other cultures with the basis of cultural empathy. Cultural empathy requires that people should get rid of local culture to certain degree and should understand other cultures at a relatively objective position. This understanding is more objective and exact. By this self recognition and comparative recognition, people can master the differences between local culture and other cultures. As a result, managers can take these cultural differences under control by proper management ways.

The second step is the trans-culture integration. Trans-culture integration aims at realizing trans-culture harmony by trans-culture understanding and trans-culture communication, and achieving the business mode with features of host country culture. In other words, with the basis of common understandings to culture, according to environmental requirements and group strategies, we can cultivate a powerful corporate culture among children companies, and mother company. This corporate culture is clear with continuity and coherence. It reflects features of the group and is right for the environment. Besides, it possesses strong powers that can make every employee to combine his or her thoughts and behaviors with corporate targets and tenets. On one hand, it can reduce the cultural conflicts. On the other hand, it connects Mother Company with children companies more closely, overcoming information distances caused by geophysical distances, and complementing shortages in technologies and finance. Meanwhile, it can help to build up nice brand fame for the group, enhancing the hotel group's cultural changing abilities.

The final step is the trans-culture training. It aims at improving people's abilities of reacting and adapting to different cultures, driving the communication and understanding between people with different cultural backgrounds, transferring the product of cultural integration ----- common operational thoughts and powerful corporate culture to employees, and forming an influencing culture cohesion in internal company.

## **3. Construct a hotel culture that suits for Chinese national culture**

In the international hotel group, the management is not only a process of conflict or separation of Chinese and western cultures, but also a process of integration of Chinese and western cultures. Cultural conflict and cultural integration run through the all process of trans-culture management of international hotel group in China. Comparatively speaking, the cultural integration process is more important because it is only a transition process although it is an inevitable process in the form of corporate culture of hotel group. Cultural integration is the key of trans-culture management in international hotel group.

Kempinski Hotels Beijing is composed of three countries, namely Germany, China, and Korea, four investors, and seven companies. German Kempinski Hotels is registered in Geneva, Switzerland. Its five-star hotels have experienced the conflict and friction of Chinese and western cultures, and the integration of Chinese and western management thoughts. Fortunately, the top managers have a deep understanding toward German culture. They are good at making innovation considering Chinese situation. In management, they lay more stresses on the service spirit of "I am good for everyone and everyone is good for me" and the management thought of "taking employees as the No.1". As a result, the management organically combines German scientific and precise management style and Chinese humanism together, and forms a successful corporate culture integrated by Chinese and western cultures. In order to cultivate the corporate culture in China, international hotel group should emphasize on the behavior culture, system culture, and spirit culture, based on pursuing the integration of cultures.

### *3.1 Pursue the unity of excellence and harmony, and cultivate behavior culture in hotels*

Western hotel management pursues excellence, and eastern harmony. If a hotel pursues excellence and gives up harmony, it will destroy the social base for excellence. And it is impossible to realize hotel's social values and social benefits. If a hotel pursues harmony and gives up excellence, it will take harmony as the goal and kill all inventions and innovations departing from harmony. International hotel group should pursue the integration of excellence and harmony. Based on excellence, it can realize higher harmony, hold the spirit of harmony in competition, and pursue excellence. Emphasize on the protection of environment. Enhance employees' consciousness of environment protection and consciousness of serving the society. Strengthen total quality management and drive the sustainable development of society. In pursuing economic benefits, the group should pursue social benefits. And in pursuing excellent performances, the group should pursue the harmony of internal and external business environment.

### *3.2 Pursue the unity of system management and soft management, and cultivate system culture in hotels*

The core of western hotel management is system management, emphasizing on technologies and rationalities in management. Insist on "hardware" but neglect "software". Insist on "material" factors but neglect "human" factors. It lays stresses on laws, reasons, and emotions in sequence. Western hotel management is centered on strictness. It can help to escape from harmful behaviors. However, it will directly lead to the antinomy between hotel employees

and managers. Soft management emphasizes on value principles and corporate spirits. Insist on human relationships but neglect rational reasons. It follows the sequence of emotions, reasons, and laws. Chinese hotel management usually uses parties and unions to infuse the primary principles and value faiths, including fundamental corporate tenet, what can dominate employees' behaviors. By this way, employees can increase their recognition to the hotel. And the hotel can possess stronger cohesion. In corporate management, the "hard" and the "soft" is a pair of contradictory unity. Soft management includes hard elements. We should get rid of the negative elements in traditional management. In hard management process, improve the soft elements and construct a human-oriented management idea. The scientific, practical, flexible, and effective management should hold both merits of hard management and soft management.

### *3.3 Insist the unity of legal spirits and ethic morals, the unity of interest-chasing behaviors and moral behaviors, the unity of individualism and collectivism*

The implementation of constructing hotel's spirit culture and legal spirits is to make up strict regulations, orders, and management. Turn human management into legal management. However, eastern nations have a primary feature as they are engaged in the modernization process. They lay stresses on the continuity and development of nations and ethics. As the international hotel group regulates its operational behaviors and management orders, they should notice the group's value orientation, especially the human values, and construct its corporate culture by innovation. Western hotels aim at pursuing maximum economic profits. This interest-chasing behavior may stray away from the social harmony. Chinese hotels usually restrict people's economic behaviors by moral principles. The highest target is not only economic interests but also special social benefits, cultural benefits, and management benefits. Only by completely taking the profits of employees, consumers, and society into consideration, can the international hotel group benefits its development and realize the top of interests.

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# Study on Psychological Contract Based on Performance Communication

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## Abstract

Performance management is a durative intercommunication process, and psychological contract is unwritten concealed contract between organization and employee, which is a sort of subjective understanding and apperception. Through deep analysis of the effect of performance communication on performance management and psychological contract, this article puts forward the psychological contract violation communication model based on performance communication on the base of the psychological contract violation development model, and makes performance communication exert double functions that enhance the performance of organization and amend psychological contract among organizational members.

**Keywords:** Performance communication, Psychological contract, Violation communication model

Performance management is a durative communication process which is ensured to be completed by the agreement achieved between employees and their charge, and in the agreement, they will establish specific aim and understandings for the future work, and integrate possibly beneficial organizations, managers and employees into the performance system (Robert, 2002). The keys of performance include the durative communication process between manager (employees' direct senior) and employees, and the continuity and validity of performance communication.

Psychological contract will continually change with the change of the environment, and in the change process, to reduce the disagreement of understanding between two parties is very important, and full and effective communication will make the psychological contract between employees and organization achieve balance. Performance communication can offer the platform of communication for organization and employees, and through this sort of communication, the organization can find employees' potential abilities and further confirm the anticipation and demands between organization and employees. The confirmation of both demands can make for both parties to adjust themselves and finally achieve the coherence of psychological contract.

## 1. Performance management is performance communication

The work of performance management is completed by the superior and underlings together in the organization, and through both mutual cooperative means, i.e. communication, because this sort of performance management is beneficial for the developments of employees, manager and organization. The performance management is a sort of tool to improve bad performance and enhance performance together, and it means the superior should keep durative bidirectional communication with employees, and it is the process both learning and advancement together (Robert, 2002). For underlings, it is to enhance performance, and for superior, it is to enhance the ability of management. Therefore, one nuclear work of the whole performance assessment is the bidirectional communication, and the result of communication is to enhance the performance management level of the organization and increase mutual apperceptions.

### 1.1 The meaning of performance communication for organization

The performance management should serve for the perspective and strategy of the organization and promote that the organization realizes its task and objective, so every member in the organization should confirm what are the objective and task of the organization. When decomposing the objective, the communication becomes into one piece of important content for the organization, manager and employees. If the objectives of the organization and its

interior underling departments are very clear and these objectives are associated with every employee's task, so the efficiency of the organization will be higher. When employees know the importance of their works for the success of the organization, their morale and productivities will be fully enhanced.

At the same time, when the organization decomposes the objective to concrete employees, every piece of objective should can be measured and assessed, and the organization, manager and employees should have same understanding to the object. The performance objective should be instituted by the line manager and underlings together, and completed through continual communications, and the human resource manager can not perform this work. Every department is a concrete performance management unit, and the line manager is the performance principal of this unit, and only the line manager has right to make objective known to lower levels and implement assessment.

### *1.2 The meaning of performance communication for manager*

Some researches showed that many managers felt time was not enough, but why? When employees have no ideas about what they should do, how they should do and why they should do, it will certainly increase many works for the manager, because the problems that employees can decide are also sent to the desk of the manager. If employees have no enough understanding to their own works, they will hardly make good decisions, and even for very small problem, the manager have to make decision.

The performance communication is a sort of advance investment to make employees complete their works. Through performance communication, employees will know what the superior want them to do, what decisions they can make, how many degrees they can complete the work and when the superior must participate in. Only in this way, it is possible to allow manager to complete the work that only he can do, and accordingly the manager's time is saved. Through communication, the manger can help underlings to enhance their abilities, comprehensively know employees work situations, grasp the information of work headway, offer corresponding special assistance and resource, effectively grasp the proofs of the assessment and objectively and justly assess underlings' work performances, enhance the manger's validity of the work, and enhance employees' satisfactory degrees to the performance assessment and the encouragement mechanism closely correlative to the performance assessment.

### *1.3 The meaning of performance communication for employee*

Because the performance management is a process to complete the work with employees together, so the manager has to make employees know the benefits for them and ask employees how to do the work better. Usually the performance managements of some enterprises have not achieved the anticipated effects, and one reason is that managers have not realized the importance of performance communication. The performance management requires periodic and aperiodic communications between managers and employees, and which can make employees obtain the feedbacks about their work performances and work actualities. The performance management can help employees clarify what they should do and why they do this, and make employees continually amend their bad aspects in their performances in the process. So the performance communication offers possible opportunity to help employees to enhance their skills and find reasons why the performance is baffled, for example, the raw material is unfitted.

The communication can help employees continually obtain the feedback information about their work performances such as customers' grumbles, the shortage of the work, the deficiency of product quality and other information, in order to continually amend their warps and enhance their skills, and can help employees timely know the objective adjustment of the organization and the change of work importance in order to properly alter their individual objective and work task, and can help employees timely obtain assistants from the superior and achieve the objective better.

## **2. Effects of performance communication on psychological contract**

Robinson further defined the psychological contract, and he pointed out that the psychological contract was a series of faith of mutual obligation between one employee with his obligation, and these faiths were based on the subjective understanding to the promise (Morrison E W & Robinson S L, 1997, p.226-256). That is to say, the psychological contract is a sort of subjective feeling which has the character of subjectivity, and this sort of subjectivity decides the specific cognitions what and how much every employee should contribute for the organization and what and how much the organization should return to him. These contents influence employees' work attitudes and behaviors simultaneously.

One distinct character of the psychological contract is the dynamic character, and the psychological contract will change with continual changes of time and environment. Meuse, Bergmann and Lester (2001) pointed out that the psychological contract will change with the process of time, especially in a long-term. Their researches found that in



different ages, employees' psychological contract level (actually it means the satisfactory level of psychological contract) had different obvious representations, i.e. with the development of age, the psychological contract basically presented downtrend (Rousseau D M, 1982, p.121-139).

### *2.1 Durative performance communication can help organization and employee to share information together*

Robert Bacal had pointed out that the performance management cycle begun from the plan, and ended by review or evaluation, but the most effective stage that made the method of performance management exerted functions was the durative communication in the middle of plan and evaluation (Robert, 2002). One intention of durative performance communication is to keep the work process is dynamic, soft and sensitive. The communication can timely modify objective and work task, and can eliminate the disagreement of understanding to the psychological contract between organization and employees.

Some researches showed that the more information both employees and organization know each other, the more coherence both understanding will achieve. Through making the performance management turn into a sustainable process of information communication and feeling communication, the organization can exert the function of performance management, influence manager and employees' subjective understandings, which doubtlessly accords with the subjectivity and dynamic character of the management of psychological contract, and durative communication will make the difference between psychological contract and anticipation and organizational promise reduced, and make both anticipations and demands known more profoundly and comprehensively, and keep the dynamic coherence of psychological contract.

### *2.2 The performance feedback process can promote communication and influence the psychological contract between organization and employee*

Through performance management, the organization can assess employees' competence degree to the work, measure their work developmental potentials, find employees advantages and shortages, institute relative training projects and make training measures and plans implement favorably, improve the communication between superior and junior and make both know their anticipations each other, and more understandings can reduce more subjectivities of the understanding. If the intention of the performance management wants to be realized, it should implement effective and durative communication, timely feed back information obtained through assessment and employee's behaviors.

The performance feedback is one piece of important content of performance management. The basic meaning of feedback is the information about individual past behaviors. The feedback can offer employees' information about their past behaviors, and the information about their abilities, individual controls and exterior encouragements. Some researches found that the performance feedback can not only help individuals adjust their self-perceptions, self-assessments and behaviors, but can enhance their self-managements (Robert, 2002). At the same time, the information fed back to employees can make employees timely know the demands of enterprise, and exactly understand the attitude of the enterprise to enterprises. Both combinations can make employees go to the scheduled individual and organizational objectives, which can not only make for performance improvement, but promote employees and organizations to realize their own anticipations and demands, and achieve the coherence of both psychological contract.

## **3. The amending function of performance communication to psychological contract**

The performance communication not only is the powerful tool that organization continually enhances the performance, but makes for knowing anticipations and increasing mutual perceptions, and exerts the function of modification and adjustment for the psychological contract.

### *3.1 Durative communication will clarify psychological contract*

The communication process model constructed by the famous scholar Stephen P. Robbins (1997) possessed representative character, and this model included 7 parts including communication information resource, coding, information, channels, decoding, receiver and feedback. The model is seen in Figure 1.

Rousseau thought that the psychological contract was mainly based on employees' individual perception to the organization, and the theoretical model put forward by her took the individual psychological process to the environment and the society (Rousseau, 1982, p.121-139). The construction model of psychological contract is seen in Figure 2.

As viewed from the communication model, the communication is the process continually implementing coding, decoding and feedback to information. And as viewed from the construction model of psychological contract, the psychological contract is the process implementing coding, decoding and considering organizational factors to various filtrated information. The psychological contract possesses the characters of subjectivity and dynamic

character, and the content of psychological contract is a sort of individual subjective feeling, special experiences and opinions to mutual responsibilities. In this way, individual psychological anticipation may differ from the anticipated content of enterprise, and may differ from others' understandings. Through the comparison of two models, the communication has natural association with psychological contract, but in the process of the formation of psychological contract or coding and decoding, durative communication can achieve the coherence of psychology contract between individual and organization.

At the same time, the psychological contract has dynamic character. The formal employment contract is generally stable, but the psychological contract is in a sort of state which is continually altered and modified. Any changes about relative work forms of organization, such as the alteration of leader, the change of communication form and the change of organizational culture will influence the psychological contract. The longer time that individual works in the organization, the more extensive range that the psychological contains and it is more easily influenced by various factors (Perter, 2000). Therefore, when some factors in the organization change, the organization should reveal enough information to individuals in order to adjust the content of psychological contract, which all need durative performance communication.

### *3.2 Durative communication will amend psychological contract violation*

With the fury competition, the continually mutative exterior environment and the continual increase of possibility that the employee psychological contract is violated, this problem has become into the hotspot in this domain. Morrison and Robinson summarized the researches of the concept of psychological contract violation, and they thought unimplemented psychological contract would produce corresponding perception assessment and feeling reaction, and a complex explanation process existed between them, and the separation between the perceptions of unimplemented promise with the violation reaction produced by this should be emphasized (Morrison E W & Robinson S L, 1997, p.226-256). They thought the former meant individual's perception assessment of responsibility assumed by the organization which can not complete the responsibility in the psychological contract, which was called the un-implementation of psychological contract. The later meant one sort of emotional experience produced by the individual when the organization can not completely perform the psychological contract, which core was indignation and disappointment and came from that the organization was perfidious or the individual suffered unfair treatment, which was called the violation of psychological contract.

Some researches showed that the un-implementation of psychological contract would not induce negative reaction, but violation would induce negative influence to employees' attitudes and behaviors. For example, in one lengthways research, Robinson, Kraatz and Rousseau found that the violation of psychological contract negatively influenced employees' perceptions to the obligation of the organization (Robinson, 1994, p.137-152). Robinson and her colleagues' same investigation result showed that employee's perception to contract violation was associated with some unfavorable behaviors such as the increase of demission rate and the decrease of work performance. Therefore, the un-implementation of psychological contract differs with the violation of psychological contract, and there is a complex explanation process in this term. The reaction of employee contract violation is very adverse to the organization, and if one adjustable factor would prevent that the un-implementation of psychological contract changes to the violation and even the occurrence of un-implementation, which has important meanings to both organization and employees. This article put forward the psychological contract violation communication model based on Morrison and Robinson's psychological contract violation development model, which is seen in Figure 3.

The violation communication model opens out that before the psychological contract is performed, durative communication can reduce and eliminate the incoherence of indisposition, uncertainty, illegibility and understanding, and there is a comparative process perceived from the un-implementation of contract to the violation of contract and the communication will increase the relativity and make the comparative information more specific, and there is a explanation process perceived from the un-implementation of contract to the violation of contract and employees will find the reason and justice of violation, and if the communication is adjusted timely, employees' evaluation will develop to the active aspect, and before the employee makes the reaction of violation, the factor of communication can reduce the employees' reactions of violation.

## **4. Conclusions**

To sum up, the performance communication goes through the process of performance management, the whole operation process of enterprise, and the formation and development process of psychological contract. Through the mutual endeavors of manager and employees in performance communication, the organization can timely deal with arisen problems, the superior and junior can obtain information each other in the equal intercourse, increase understandings and feelings, and ensure that the work process is dynamic, soft and sensitive, and enhance the performances of organization and employees. In the psychological contract management, the organization should

pay attention to exert durative performance communication, ensure the continuity and validity of performance communication, and accordingly increase both perception, and exert the function to amend the un-implementation and violation of psychological contract.

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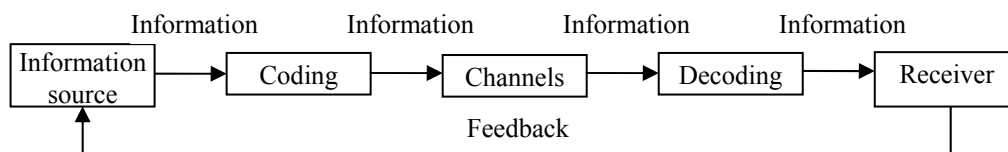


Figure 1. Communication Process Model

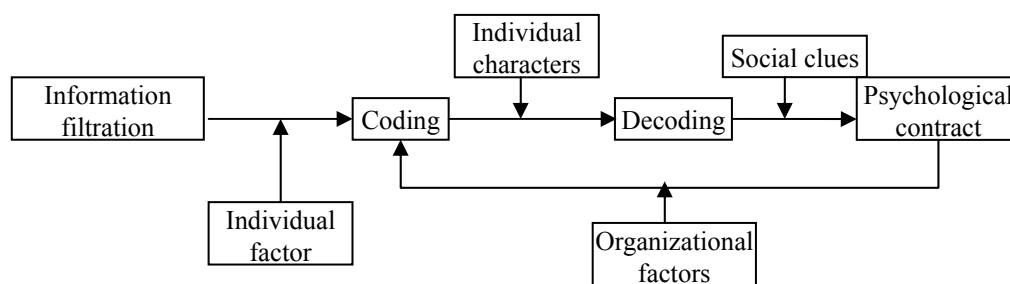


Figure 2. Construction Model of Psychological Contract

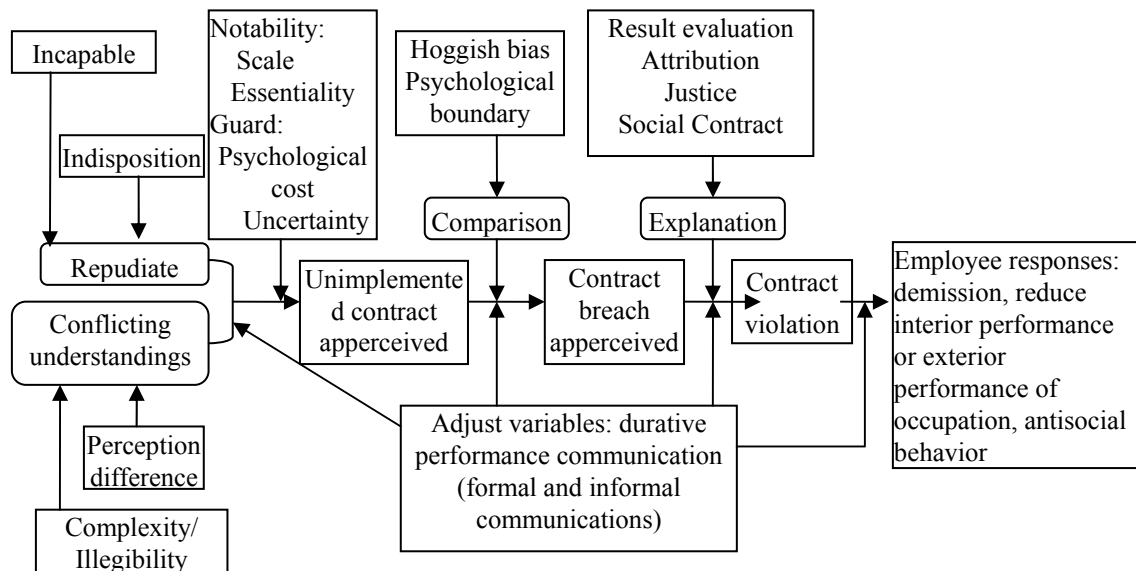


Figure 3. Violation Communication Model

# Enterprise Risk Management Implementation Model for Airport Operators in Turkey

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## Abstract

This paper aimed to developing of new ERM framework model for airport operators in the Turkey. The model is developed by collaborative study with DHMI (Turkey Governmental Authority to airport), TAV Airport Holding Co. and Celebi Holding., which they are leadership in the airport operators in the Turkey. The verbal model is used in the developing of the ERM model. Current ERM models are re-interpreted and shaped according to the Turkish airport operators. In the study, Questionnaire is applied and face-to-face interviews are made with airport managers to developing of the effective and applicable ERM model to airport business. The Istanbul-Atatürk International Airport in Turkey is selected a sample to ERM model as real world situation that there is prior international airport in the Turkey.

**Keywords:** Airport operator, Enterprise risk management implementation model

## 1. Introduction

Airports cannot be seen as just another industry. However, due to fundamental changes in the market and competitive landscape, pressure and risks on airports will increase significantly. Airports have to move towards transparent management structures with an explicit focus on the core business and clear accountability. They are present of importance and necessity of ERM implementation at airport.

The objective of this study is developing of ERM Model for the Istanbul-Atatürk International Airport in Turkey. Collaborative study is carried out with airport's executives during the application of ERM model. The model emphasizes that ERM is an integral part of the management process. Allocation and use of limited resources through an effective and systematic ERM implementation effort are critical in Turkey as well as other developing countries. Implementation of ERM model can able to provide reasonable assurance to managing risks of airport business.

The paper organized into 4 sections and begins with the ERM and related researches. Problem and Proposed ERM Model are presents in Section 3. Results are explained in Section 4 and concluding remarks is given this last section.

## 2. The Enterprise Risk Management and related researches

ERM literature is vast context. Many organizations is publishes various studies about ERM. In this study, source samples about ERM given as following;

(1) COSO Enterprise Risk Management-Integrated Framework: The framework defines essential ERM components, discusses key ERM principles and concepts, suggests a common ERM language, and provides clear direction and guidance for ERM. Engaged by COSO to lead the study, PricewaterhouseCoopers was assisted by an advisory council composed of representatives from the five COSO organizations (COSO, 2004).

(2) Enterprise Risk Management: Frameworks, Elements, and Integration (2006): Statements on Management Accounting (SMAs) present the views of IMA regarding management accounting and financial management issues. In their development, the Statements are subjected to a rigorous exposure process. The 2006 SMA on Enterprise Risk Management: Frameworks, Elements, and Integration provide an overview of the ERM process and frameworks and will help management accountants understand their roles and responsibilities in ERM projects (IMA, 2007).

(3) Enterprise Risk Management: It's Implications, Benefits and Process (2006) publishes by General Re. According to the resource, ERM has come out from behind the curtain. All insurers, to some degree, will have to begin assessing their risk management capabilities and processes. ERM is a good business practice and companies can turn the new ERM standards set by rating agencies into a competitive advantage. If companies look beyond "Checking the box" for meeting rating agency criteria, the real value of ERM can be realized and result in more profitable business practices down the road. This paper describes the ERM process, its benefits and implication. We will then examine how the rating agencies have taken up ERM as an important aspect of the rating process.

(4) The Principles of Enterprise Risk Management is published by Virchow, Krause & Company. According to the study “ERM can be tailored to any utility's operations. In today's utility environment operating without ERM principles in place is taking a gamble that nothing will go wrong, or that you will be successfully reactive to factors impacting your business. You wouldn't run your personal household that way, would you? This paper explains the journey into the intricacies of understanding and implementing an ERM program at your utility or organization. To fully understand the mindset and process behind ERM, we must first discuss the founding principles of ERM and its application in various industries” (Virchow, Krause & Company, 2006)

(5) Enterprise Risk Management: Theory And Practice (2006) is published by Ohio University. In this paper, they explain how ERM creates value for shareholders. In contrast to the existing finance literature, we emphasize the organizational benefits of risk management. They show how a firm should choose its risk appetite and measure risk when implementing enterprise risk management. They also provide an extensive guide to the implementation issues faced by firms that implement ERM (Stulz & Nocco, 2006).

(6) Enterprise Risk Management: Specialty Guide (2006) is published by Society of Actuaries. The Society of Actuaries has undertaken an initiative to educate the public, and especially industry leaders who are in need of guidance in matters involving risk assessment and control, about actuaries' unique set of skills that are particularly relevant in today's climate of risk quantification, classification and mitigation. This Specialty Guide on ERM is a work in progress, begun in the spring of 2004 by members of the ERM Working Group of the Society of Actuaries Risk Management Section to serve as a fundamental resource for a basic understanding of ERM, as well as a guide to further study of the subject (Society of Actuaries, 2006).

Many resources, guidelines and surveys are published in ERM literature. But any research or guide doesn't exist about airport ERM. Therefore, the study is aimed to contribute for this field.

### 3. Problem and Proposed ERM Model

The study is dealing solving with “What kind of ERM model should develop to airports in Turkey” main problem. ERM implementation is not “one-size-fits-all” kind approach to any organizations. So, every organization should develop their ERM implementation model and its process. This paper aimed to developing an ERM framework model for airports in Turkey. The model is developed by collaborative study with DHMI (Turkey Governmental Authority to airport), TAV Airport Holding Co., and Celebi Holding, which they are leadership as the airport operators in the Turkey. The verbal model is used in the developing of the ERM model. For this aim, Current ERM applications are analyzed and ERM guidelines/frameworks are reviewed. Current ERM models are re-interpreted and shaping for airports. Also this new model is clings to current ERM framework by published COSO.

In the study, Questionnaire is applied and face-to-face interviews are made with airport managers to developing the effective and applicable ERM model to airport business. The Istanbul-Atatürk International Airport in Turkey is selected a sample to new ERM model as real world situation that it is prior international airport in the Turkey (Kucuk Yilmaz, 2007).

As illustrated in figure-1., new ERM model is consist to 32 steps: 6 main steps and its sub-step. They are listed following (Kucuk Yilmaz, 2008);

#### (1) Analysis of internal environment and determination of requirements of ERM

- a. Declaration of organizational objectives and aims
- b. Determination of external and internal pressures (with their risks)
- c. Analysis of internal audit structure
- d. Analysis of information systems
- f. Determination of organizational resource and their allocation
- g. Determination of organizational strategy and its relationship with ERM
- h. Supporting of ERM by the current managerial approaches, applications and functions: strategic management and planning, corporate governance, line management, portfolio management, value management, etc.

#### (2) Establish of ERM strategy; Establish of substructure requirements about ERM

- a. Definition of organizational ERM vision, mission and strategy that they are guide and shaped to ERM model
- b. Determination of current ERM and risk perceptions, ERM and risk culture by using of the different analysis techniques
- c. Determination of useful ERM guidelines and reports, best practices; Decision making of which guides are using to developing ERM model

- d. Develop a common risk language and ERM terminology
- e. Analysis of organizational capabilities, abilities according to the desired ERM model and its implementation efforts.
- f. Training and education about fundamental ERM concepts, conceptual framework, process and practice steps for managers and related other staff in airports.
- g. Building of organizational risk profile and determination of risk tolerance line.
- (3) Establish of ERM function and committee
  - a. establish a suitable ERM function
  - b. Place of the ERM Committee (CEO, CRO, CFO, CIO, etc.) in organization chart.
- (4) Establish of ERM information system and determination of ERM framework
  - a. Establish suitable ERMIS (Enterprise Risk Management Information System)
  - b. Establish Documentation procedures and format
  - c. Establish reporting format and line (top-down, across, down to top, external and internal parties)
  - d. Benchmarking of the best ERM framework to airport by analysis other ERM models in the guidelines and reports
  - e. Decision making and establish of the suitable ERM framework
  - f. Determination of the risk identification tools, methods and models ; Definition of current and possible risks to airport
  - g. Determination of the risk assessment tools, methods and models
  - h. Assessment of the risk analysis result as their impact and severity
  - i. Classification of risks in the four main categories: strategic, financial, operational and threat risks,
  - j. Risk mapping and Risk prioritization
  - k. Selection and application of agreeable risk responses
  - l. Establish continuously monitoring and review function
- (5) Data flow and feedback; Analysis of ERM implementation performance
  - a. Update and improving of the ERM system
  - b. Provide effective and well-timed data flow and feedback line and the determination of their context
  - c. Assessment of the organizational ERM application performance in respect of the both system and the related managers & staff
- (6) Provide continuous improvement & development about ERM Process

Provide continuity both ERM system and its improving; Restart to ERM process over loop to new and developing risk and environment

This model is ERM framework to implementation in the airport. It has serial steps. Every sub-step is sufficiently explained to "what should do related main steps".

Main research problem is developing of best and suitable ERM framework model and its appropriate adaptation for airports. This study is focus on this problem and its solution.

Verbal model is used to developing of new ERM model. As a known, verbal models tell the real system or process with words. In these kinds of the models components and relationships are defined with words. In this study, main and detailed steps are developed as arranged in order. Verbal models use words to represent some object or situation that exists, or could exist, in reality. Verbal models may range from a simple word presentation of scenery described in a book to a complex business decision problem (described in words and numbers). A firm's mission statement is a model of its beliefs about what business it is in and sets the stage for the firm's determination of goals and objectives (Encyclopedia of Management, 2006).

The study is prepared according to the Istanbul-Atatürk International Airport in Turkey. The implementation of the ERM model is not a "one-size-fits-all" analysis. So, the model is tailored according to the qualifications and various parameters of the Turkey Airports and especially to the Istanbul-Atatürk International Airport. All efforts achieved with coordinated studies with airport managers in the Turkey as following steps:

- a. Turkey airports are analyzed about ERM infrastructure and capabilities, objectives and wants related ERM.

- b. The model tailored according to the determinations.
- c. Basic ERM framework and process is prepared according to the general ERM context.
- d. ERM model integrated with organizational ERM process.
- e. ERM Information Management System (ERM-IMS) developed as shown figure 2.

ERM information management systems are designed to overcome the problem of aggregating data across the organization. The design of an information system depends on the risk measurement methodology that a firm chooses. The current and likely future improvements in risk management information systems make feasible new ways of collecting aggregate data on firms' risk-taking activities. The problem of designing an information system for risk management is a problem of aggregation (Gibson, 1997).

#### 4. Results

Developed ERM model is generally implemented in International Istanbul Airport because of the scope of this study, characteristics of the subject and time for giving results. The model implementation executed with high level airport managers as coordinated studies. The model and implementation results are presented to these managers. They are started efforts related in establish ERM framework in their airports since 2006. This can be considered as study's contribution to airport sectors.

Any framework model not exists in the world and Turkey according to the airport ERM implementation. Also, the any conceptual and theoretical study doesn't exist in Turkey about ERM. In this concept, suggested model is prepared as to answer these deficiencies. However Fraport A.G. has successful ERM system. Their system is analyzed during the study preparation process. Sydney airport has integrated risk management system. Finally, an ERM practice has very narrow airport business samples across the world.

The Istanbul-Atatürk International Airport is selected as research sampling in this study which there is biggest and prior airport in the Turkey. The study is separate and superior from other frameworks in the ERM guides and reports since the study focused critical elements for the airports. They are;

- a. External and internal pressures to the airport management
- b. Airport risks as enterprise wide: strategic, financial, operational and threats risk categories
- c. ERM committee structure
- d. ERM implementation process and their steps
- e. Critical success factors
- f. Integration of ERM to organizational structure

Completed and achieved studies within this research period are given following order:

- a. A questionnaire as a qualitative research technique is prepared to investigate perception and approach of ERM across organization and their personnel. This questionnaire, including structured and unstructured question sets, is applied to major airports. Questions of questionnaire are prepared to demonstrate risk and ERM perceptions with other substructure elements of effective ERM. Also, the questionnaire is prepared to determine the situation and dimensions of governance since ERM interrelated with corporate governance, strategic management, strategic planning, organizational objectives and mission of enterprise.
- b. Applicability analysis of ERM is achieved for all airports in Turkey. Results of this analysis used to determination of current situation of ERM substructure. Also, main requirement and deficiencies are determinates with this study.
- c. New ERM framework model is created for airports and integrated general ERM process. The model offered to airport managers to establish their system.
- d. ERM age started in the Turkey's air transportation sector: airports and airlines. This is an important development for Turkey civil aviation sector.

The fact that the nature and importance of air transport is changing has long been recognized.

In Turkey, ERM implementation is apply by TAV Airport Holding Co. since 2006 as full ERM concept. TAV is unique sample related to ERM in the Turkey. However, other airport managers are willing to increase the awareness for ERM at level of corporate. Their efforts are improving across their organizations in this field. Turkey's air transportation sector and airports do pay attention to the ERM implementation with start of the study. Having in mind the compliance efforts to entrance to the European Union, airport managers have to start their practice towards the establish and implement of ERM and it will require strong effort inevitable for gaining new knowledge and experience in application of the active principles of ERM. ERM simply enables management to operate more



effectively in environments filled with risks, and in volatile markets such as Turkey (Kucuk Yilmaz, 2006).

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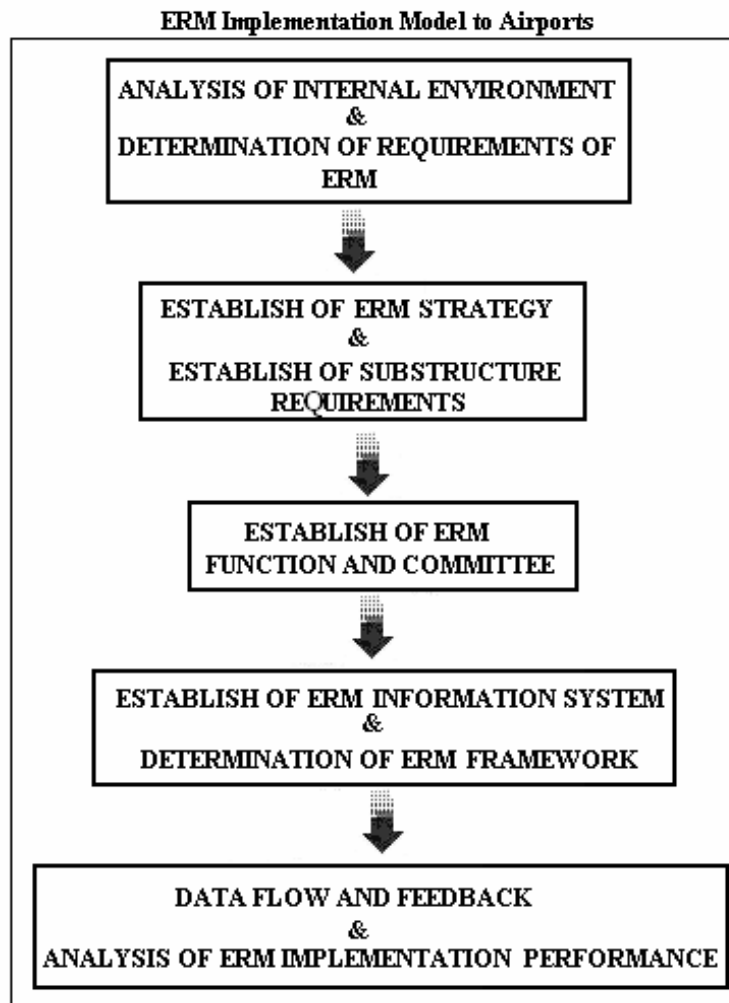


Figure 1. The new ERM implementation model (Kucuk Yilmaz, 2007).

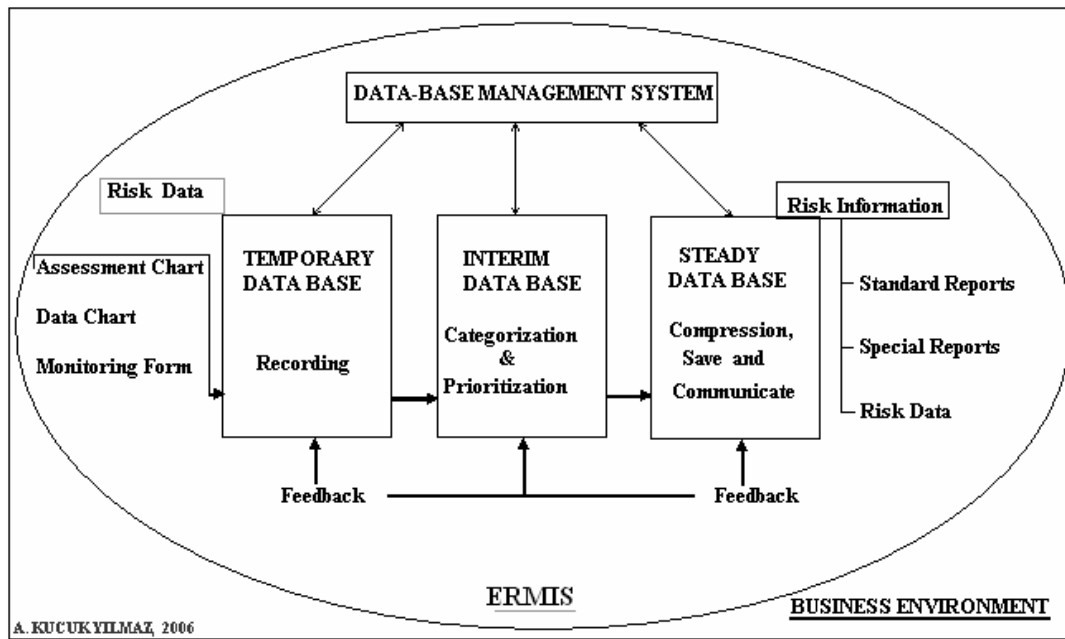


Figure 2. The ERM information system, (Kucuk Yilmaz, A. 2007).

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