WSR ANALYSIS TO THE DEVELOPMENT OF AN ENTERPRISE MANAGEMENT SOFTWARE PROJECT[1]

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ABSTRACT

In this paper, a software development project of enterprise management is analyzed. For most enterprises in China, the management levels are still very low. So are the practices of computerized support for managerial work. Comprehensive reforms have to be made so as to change poor situation and meet global challenges. Continual heavy investments have been going to computerized support management among most state-owned enterprises (SOEs). In enterprises management software market, foreign brand products have a big share. Many domestic computer companies are also involved due to so huge a market where oriental culture factors play important roles. This paper analyzes one private company's two-year project on enterprise management software development by applying an oriental *Wu-li Shi-li Ren-li* (WSR) system approach. Some big issues in the project are presented, conflicts between different viewpoints about computerized support for enterprise management, especially along with the globalization trend and tremendous development of the Internet, dilemma in the pursuit of western management style and unavoidable involvement of oriental messy human relationship, organizational impacts to the project implementation, and inappropriate framework of the project teams which brought wastes in human resources. After a brief introduction of the approach, WSR analysis to those issues is presented. Till now, a whole practical software package has not finished yet. WSR approach to such a case study forwards further thinking of most problems in the information technology (IT) industry in China.
Keywords: *Wu-li Shi-li Ren-li* system approach, computerized support for enterprise management

INTRODUCTION

Nowadays, decision-makers often face two kinds of situations: one is overwhelming information, especially as the proliferation of Internet leads to an explosion of information. The other is lacking information. Most Chinese enterprises' managers are

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short of necessary information support for flexible response to market changes, especially as modern enterprise systems have been adopting during the country's transferring period of the economy incremental mode. In reality, both situations often happen simultaneously, which actually reflects one key problem, lack of knowledge. The information explosion demands strong knowledge processing capacity to extract knowledge from seas of information for organizational strategic planning and management. Lacking information refers to lack of knowledge for acquirement of useful information or poor qualified knowledge structures for better communication due to defects in organizations. That is one of the reasons to build computerized support for decision making. We can see many such support tools: management information systems (MIS), decision support systems (DSS), group support systems (GSS), enterprise resources planning (ERP), knowledge management (KM) tools (usually for organizational collaboration work), etc. How about those labeled tools in China? By products' brand, foreign brands such as SAP and Oracle had entered into China with a number of successful applications, and most of which were at joint venture or foreign companies. Lots of domestic enterprises built their own MISs by domestic companies, scientific institutions and universities. This market is so huge and differentiated that no one can cover the whole. As to the application results, more than 90% failed among those projects implemented before 1992. Since 1998, another tide for ERP systems arose. Considering the huge market, the expensive foreign brand products and service, and lower level of domestic managerial software applications, some people engaged in consulting by global brand products; some domestic entrepreneurs in developing their own products to meet practical demands. Bridge Group's over two-year project in developing enterprise management software is among the latter.

This paper analyzes the project implementation process. Major issues in this project are addressed, conflicts between different viewpoints about computerized support for enterprise management, dilemma in the pursuit of western management style and involvement of oriental messy human relationship, organizational impacts to the project implementation and inappropriate framework of the project teams. Those issues are typical problems in that field in China. An oriental system approach, *Wu-li Shi-li Ren-li* (WSR) system approach is applied here to analyze those issues. The analysis does not aim to give resolutions of those issues that had already happened but try to indicate that proper system methodologies for project implementation is critical to the success of the project. Next the case project is introduced.

BRIDGE 99 FOR ENTERPRISES MANAGEMENT

A private business organization, Bridge Group, starts business at IT related consulting. Most of her customers are governmental departments and companies. She also has cooperation with some foreign companies. Outsourcing is a salient feature of Bridge Group, who keeps on contacting with first-rate universities and research organizations in Beijing. Part-time experts or consultants even undertake some major jobs at some projects. The number of full-time employees is less than 100.

By experiences in consulting and continual comparison strategic planning between those global groups and most Chinese organizations, Mr. G, the vice president of Bridge Group formulated his own methodology on enterprise strategic consulting, especially after studying those business solutions by some famous global consulting companies, including Anderson Consulting.

Bridge's Methodology in Enterprise Consulting

In Mr G's methodology, decision behaviors in an enterprise are grouped into 6 categories: decision-making, organization, planning, control, coordination and stimulation. The objects of those behaviors are people, money, materials and information. Each position in an enterprise can be defined by those 6 categories of behaviors. Then the behaviors of each position in the enterprise can be standardized, which serves as regulations for positions.

There are three functional modules in computerized support for enterprise management, *monitoring*, *planning*, and *decision-making*, where

- Monitoring serves as a cockpit where of meter panels of all real-time information about enterprise's operation. Performance indicators tell the pilots (managers) current situation of the enterprise for their decision-making.
- Planning refers operational scheduling, to allocate budget, human resources and materials for each task within an enterprise according to definition of the standardized behaviors.
- Decision-making covers simulation in organizational framework, resources allocation, collaboration, and competition so as to appraise the comprehensive capacity of an enterprise in the market.

Developing Software Package based on Bridge's Methodology

Mr. G was eager to develop a software product for his methodology so as to apply to Bridge's customers. Software development department (SSD) was then established. The whole software development process during two years can be divided into 4 stages.

(1) *Seeking suitable people for system design* Initially, some management researchers from some famous university were invited to do system analysis for G's methodology. A method group (MG), which mainly consisted of those part-time experts, was founded at SSD in 1998. After 6-month work, those experts left with conclusion that such kind of project was infeasible for implementation. Little outcome incurred warning from the president of the Group who set a deadline for the project. A software engineer Mr. O became the head of the department by his promise to finish the project within 3 months. At that time Mr. G did need those kind of people to continue his undertaking of his methodology; he also needed people with higher degrees understand his ideas and made good designs. Dr. W came into MG. His academic background brought him more advantages in communicating with Mr. G while his arrogant attitude also annoyed Mr. O.

By discussions, Mr. G and Dr. W gradually drew a rough scenario of the expected software package (named as Bridge99). Project seemed make progress.

Then Dr. W began to search for competitive researchers for conceptual design. He contacted with top scientists in computer science, systems engineering and management in China, disseminated Mr. G's methodology and asked them to join. Those old scientists recommended younger people, most of them owned doctoral degrees. Some were selected to be MG's part-time experts and their big professors became senior advisors of the companies. Some advisors indicated appropriate teamwork and right methodology were of much attention before any formal large-scale activities were taken.

(2) *Making system design for Bridge99 knowledge base framework* Cooperating with Dr. W, two part-time experts Dr. H and Dr. J who are specialists on artificial intelligence, quickly improved the rough scenario into a more clear system framework (as shown in Figure 1) where more recent academic advances were applied.

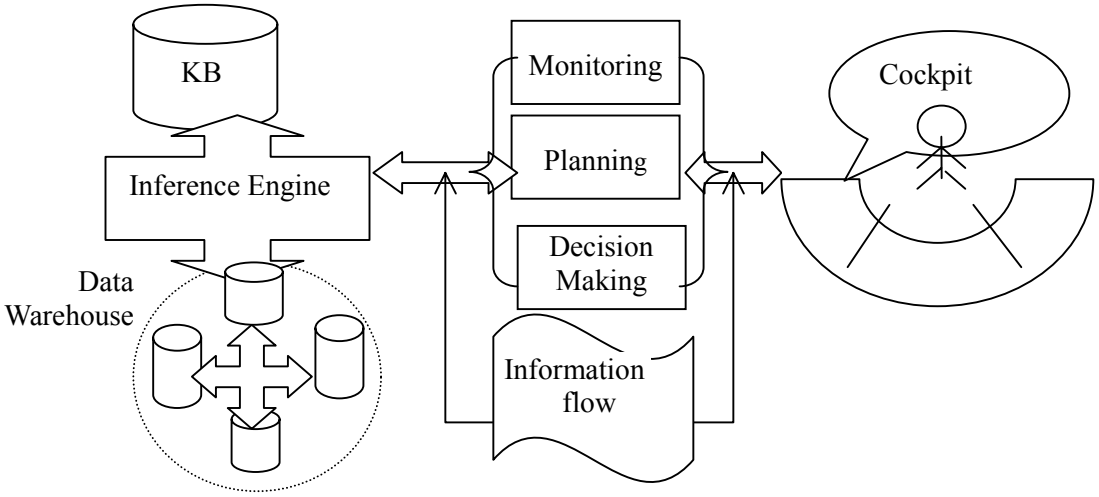
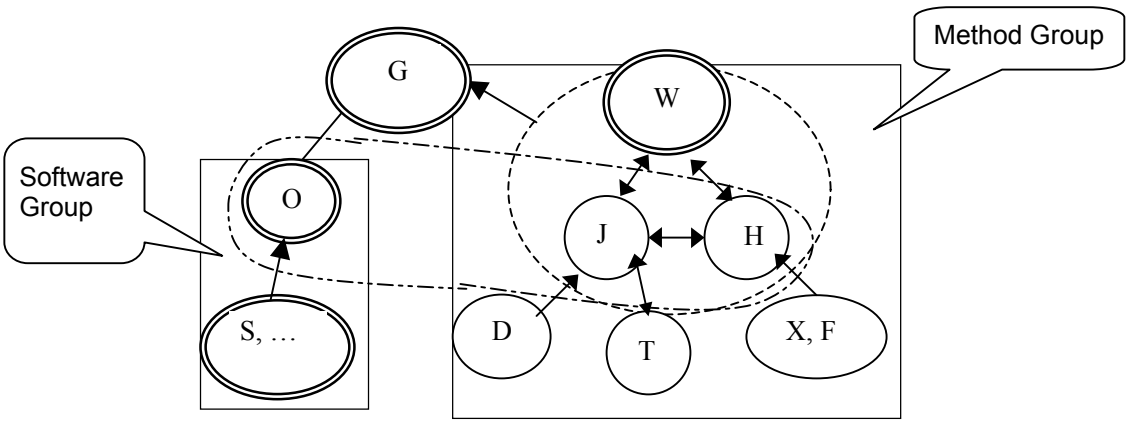


Figure 1. Framework of Bridge99

Enamored with those concepts, such as knowledge base (KB), semantic templates, nonlinear systems, chaos, dissipative structure, self-organization in non-equilibrium system, Mr. G applied those concepts to his methodology. KB is used to store enterprise information by semantic network. All behaviors in an enterprise are transformed into relevant semantic templates. One item in a semantic template is a standard behavior. Processing sequence of one specific task can be achieved through an inference engine. Under such kind of knowledge-based framework, three doctors undertook three modules' design, whereas Dr. J only took the organizational simulation design in decision-making module. Mr. G was very satisfied with the progress. Then specialists in management were invited to finish all semantic templates about a complete enterprise; operations research experts to provide algorithms of optimal scheduling at planning module. However, those late-arriving part-time experts, including Mr. T, Mr. D, Dr. X, Dr. M and Mr. F, questioned the feasibility of ambitious design and did not follow that. Contradictions appeared.

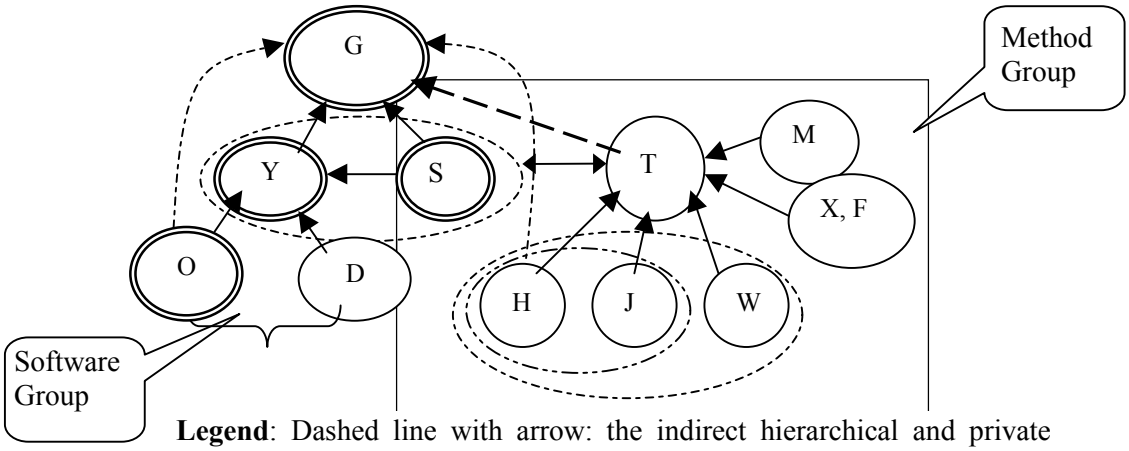
Meanwhile, Mr. G started a campaign to instill Bridge99 concepts into every employee in the company, especially those mid-level managers. Most of audiences also questioned the feasibility of Bridge99 in practice due to its explanations in enterprises' operations using dissipative structure.

(3) *Foreign manager's re-structure of the development department* As MG expanded, a Singaporean Dr. Y came to take charge of both SSD and a training/cooperation center in the second half year of 1999. Before his arrival, either Dr. W or Mr. O ran for that position. Group leaders expected to integrate western management style and oriental culture considerations to facilitate to finish the project before 2000 (deadline). Dr. Y mainly undertook business process reengineering (BPR) work to overcome collision. He re-structured the whole department and assigned part-time management expert Mr. T as the head of MG and one full-time engineer at software group Ms. S as a facilitator. However such kind of restructuring intensified the conflicts between three doctors' and the other experts. The organization of MG and SSD before and after Dr. Y's re-engineering is as shown in Figures 2 and 3, respectively.



Legend: *Double-cycle*: full-time; *Single-cycle*: part-time; *Dashed cycle*: self-organized group; *Rectangle*: administrative unit; *Solid line with arrow*: direct administrative relation between the start and the end sides.

Figure 2. Experts Relations in Method Group for Bridge'99 Project before Reorganization



Legend: Dashed line with arrow: the indirect hierarchical and private relation between the start and end sides; others same as those in Figure 2.

Figure 3. Relations between Experts after Reorganization

Those self-organized group shown in above figures were formulated mainly by when those experts joined the Bridge and who originally recommended them. During conflicts evolving, Dr. Y's authority was challenged since he did not decide which technical path to implement Bridge99 at some critical points, especially after serious debates between experts at weekly meetings. Three early arriving doctors and Mr. O often ignored Y's existence and expressed their personal opinions directly to Mr. G as before. They also despised Mr. T since he did not own Ph.D. and did not follow his assignments.

Whatever underwent, Mr. T took charge of all design work in MG. A part-time expert Mr. D was even assigned as software group head as a rival for Mr. O. Strangely, Mr. Y could not let Mr. O leave the department for Mr. G's sake. Late-coming experts proposed new designs about planning and monitoring, and even implemented resources allocation module in the end of 1999. However, Dr. Y and Ms. S regarded those results as cooperative achievements by all experts when reporting to Mr. G, which led to their conflicts with late-coming experts.

The project seemed to proceed again. Mr. G asked some experts to join practical projects to understand practical demands for further improvement. Until that time, Mr. G thought he got the key people after 2-year searching. However, due to narrow knowledge and experiences, Dr. Y and Ms. S assumed the detailed designs were finished and those experts were unwanted. Ms. S was also jealous of Mr. T's position. Eventually, hostile attitudes drove away all part-time experts.

(4) The abortion of the project Dr. Y's weak capabilities in tackling with conflicts, misunderstanding organizational culture and unsuccessful practice of western management

led to his dismiss by the company. Experts were asked back and Mr. G began to talk about Bridge2000. However, the president of Bridge Group postponed the approval of continual work. The project of Bridge99 development was actually aborted.

As a matter of course, above description is not comprehensive. Too many factors affect Bridge99. Complicated human relationships, conflicts between different disciplinary people, conflicts between academic pursuit and engineering practice, organizational affects and position limitations, personal ambitions and competitions for senior positions, etc. made whole project very complicated. Two-year heavy investment did not bring a prototype of Bridge99 especially when systems engineering methodologies were always emphasized during project meetings. Before we apply oriental *Wu-li Shi-li Ren-li* system approach to analyze those complicated factors, a brief introduction of the approach itself is given.

WU-LI SHI-LI REN-LI SYSTEM APPROACH

The development of WSR approach follows the softening trend in systems research and relevant fields. Confronting many failures in 1970s, western people began to rethink traditional hard system approach when dealing with ill-structured problems at social, economical, and environmental fields (Tomlinson & Kiss, 1984). More considerations were taken into the human and organizational elements which had been eliminated from mathematical modeling. Analytic thinking, rather than synthetic thinking, was quite inappropriate to unstructured messy problems. Soft system methodology (SSM) proposed by Checkland (1981) is one of those important achievements. SSM has been developed for use in ill-structured or messy problem contexts where there is no clear view on what constitutes the problem or what action should be taken to overcome the difficult being experienced. Along the trend, oriental system thoughts, eastern modes of inquiry and oriental ancient philosophies have gradually been noticed by western researchers due to their intuitively emphasis in human relationships and culture effects in systemic thinking (Pressman, 1992). Oriental scholars also explored their own system methodologies for dealing with complex system studies, such as *Shinayakana* system approach by a Japanese Professor Sawaragi and his students (Sawaragi, Naito and Nakamori, 1987), and meta-synthesis methodology by Chinese Professeor Qian's system study group (Qian, Yu and Dai, 1993). *Shinayakana* system approach emphasizes three '*I*'s, *interactive*, *intelligent* and *interdisciplinary*, in system modeling process. And three '*H*'s are referred to the modeler's attitudes, *honesty* in modeling the reality, *humanity* in designing support systems and *harmony* within the research group. The oriental *Wu-li Shi-li Ren-li* (WSR) system approach is a product of comparative system practices of both eastern and western system methodologies in complex system studies.

Formally proposed by Gu and Zhu (1995), WSR system approach is extracted from experiences, strategies and alternative observation during long periods of system practice in China. During the process of system analysis, design and implementation, purposeful or intentional activities are observed having three aspects: *Wu-li, Shi-li* and *Ren-li.* System practice activities are constituted by the dynamic unification of physical world (object of

Wu-li), system organization (object of *Shi-li*) and humans (object of *Ren-li*). Table 1 lists the basic ideas of the WSR approach briefly.

	Wu-li	*Shi-li*	*Ren-li*
Meanings	theory of physical world, laws, rules	theory of managing, ways of doing	theory of humanity, social norm
Objects	objective matter world	organizations, systems	humans, groups, culture, ethics, religion
Focus	*What is …*?	*How to …*?	*Shall we …*?
Principles	honest, truth, as correct as possible	harmony, efficiency, as feasible as possible	humanity, effectiveness, as flexible and reasonable as possible
Knowledge needed	natural sciences	management sciences, system sciences	social sciences

Table 1. Ideas of WSR

Wu-li explains the mechanism of what is concerned, *Shi-li* points out the framework of managerial tasks of making the best use of everything, and *Ren-li* is to make the best possible of human beings and to manage in exploring available potentials for a satisfying or reasonable result of whole activities. In reality, dynamic unification of physical world, system organization and human beings is always an aim in system practice. All inquires and interventions always cover all three aspects and their dynamic interconnection to some extent. It is better to connect *Wu-li*, *Shi-li* and *Ren-li* more or less so as to get a comprehensive scenario of the concerned problem, issue or mess for a satisfactory and feasible result. When applying WSR approach, we emphasize on **knowing *Wu-li,* sensing *Shi-li*** and **caring *Ren-li.***

Original working process for WSR approach has 7 steps: understanding desires, formulating objectives, investigating conditions, selecting models, making recommendations, coordinating relations and implementing proposals (Gu and Tang, 1995). There have been some successful applications of WSR approach to a variety of practical problems in China (Gu, 2000). Among those practical projects, **caring *Ren-li*** does not only mean the coordination between groups with different benefits or playing politics regarded by Zhu (2000). Those relation-coordinating endeavors aim to facilitate implementing feasible *Shi-li* based on right *Wu-li*. If with wrong *Wu-li* or infeasible *Shi-li*, more endeavors in relations between project participants still cannot ensure a satisfying end of the project. The dynamic coordinating process between three *li*s brings to a reasonable resolution to the concerned issue. Then the 6th stage of WSR approach in system practice does refer to coordinating relations between three *li*s, besides coordinating human relations.

Nonaka and Takeuchi (1995) presented a framework about organizational knowledge creation and discussed how Japanese companies, which were totally different from western companies, created the dynamics of innovation. Along the epistemological

dimension of the framework, organizational knowledge is created and expanded through knowledge conversion between tacit knowledge and explicit knowledge through four modes: socialization (from tacit to tacit), externalization (from tacit to explicit), combination (from explicit to explicit), and internalization (from explicit to tacit). The interactions between those four modes produce a spiral along the time dimension. Absorbing their organizational knowledge creation framework, we modify WSR working process into a spiral process while intensive coordinating activities between three *li*s will be carrying along the time dimension, as shown in Figure 4. By this way, innovative resolution is achieved towards concerned issues.

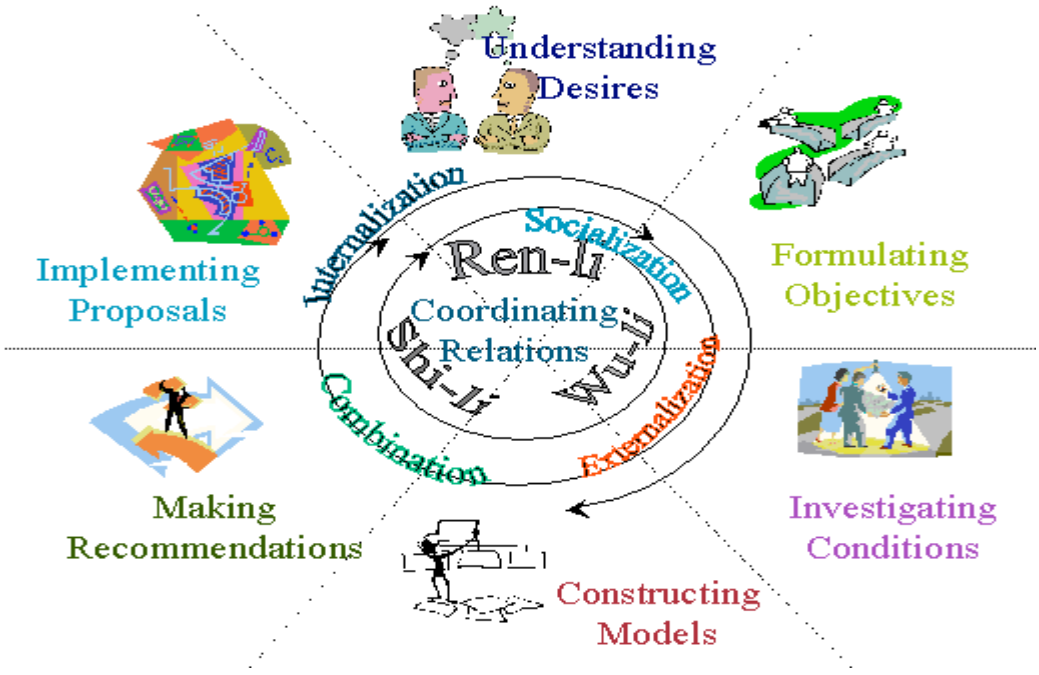


Figure 4. The Working Process of WSR Approach (modified)

WSR considerations in management support system have been continually discussed (Tang & Gu, 1996; Tang, 1997; Tang, 1998). What kind of information is needed by managers for their decision making? How to achieve proper support mode for managers? How to build such kind of computerized support? Those problems have to be given systemic thinking in correspondence with practical problems before investment. Since the 1980s, it has been noticed that the *soft elements, soft qualitative information, expertise and experience and soft problems* should be incorporated into computerized models so as to be more close to the reality and may enlarge the set of alternatives for policy-making (Fedra & Loucks, 1985). It is not only based on IT improvements, but also on creative framework(s) (for communication). Nonaka and Takeuchi offered the framework of a company as a whole to create new knowledge, disseminate it throughout the organization, and embody it in products, services and systems. Many other approaches also provide their own framework, such as standardization of management process and BPR. Mr. G's methodology is among such kind of endeavors.

WSR ANALYSIS TO BRIDGE99 DEVELOPMENT

During Bridge99 development, the obvious issues are,

- feasibility of Mr. G' methodology for enterprise management;
- coordination between Bridge managers and so many excellent academic researchers assembled into such a project which is so rare in China;
- communications between Mr. G and part-time experts in MG, between Dr. Y and experts, between experts and programmers, between MG people and other departments;

Here WSR approach was applied to project analysis, which aims to find some useful results from such an unsuccessful project.

Knowing *Wu-li* -What is the *right* thing worth endeavors?

The *Wu-li* at this project refers to develop computerized decision support for enterprise management based on Mr. G's methodology on enterprise's diagnosis and evaluation. Then three issues have to be considered, (a) is the specific methodology reasonable and feasible for organizational diagnosis and evaluation? (b) What kind of knowledge needed to make a conceptual model for computerized work about an enterprise? (c) What are differences between Bridge99, ERP and MIS?

As to (a), the answer is yes, since it covers all concerned topics for general organizational management. With advanced concepts, such as from disorder to order, dissipative structure system, etc. the methodology reflects systems thinking to enterprise's operation. The gap between most domestic business organizations and global enterprises is considered; therefore standardization of management behaviors for performance improvement is a feature and had already been applied to consulting for different customers in retailing, telecommunication and stock companies. The problem is whether it is worth to develop a Bridge99 instead of using other ready software package, such as SAP's products, to implement the specific methodology in practice.

As to (b), it is necessary to understand operations of an enterprise, to understand the business process and management workflow, which is key to building a conceptual model of an enterprise. Therefore, it is easy to understand why Dr. H's design for planning cannot be implemented while Mr. T's can. The former is only a template for generating schedules; users still have to define the business process themselves. Even though Dr. H's design can support generation of all plans, it is too general for programming work. From Mr. T's design, a programmer can understand the whole planning process at any levels of an enterprise. Proper knowledge, including practical experiences, is needed for conceptual modeling.

As Dr. H finished planning module design, Mr. F and Dr. X were recruited to implement optimal algorithms for scheduling. By their experiences, the latter did not think Dr. H finished planning design and insisted that it was more important to confirm what the

problem was before discussing algorithms. To avoid conflicts, they implemented resources allocation module for decision making instead of concentrating on algorithms for scheduling. In a holistic way, the formulation of a problem, the solving of it, and the implementation of it are three interactive processes which take place simultaneously (Ackoff, 1980). Since the formulation process of problems is not specified at Dr. H's design, algorithm exploration is not the *right* task at that time.

As to (c), continual discussions and debates had been taken to understand Bridge99 within MG. Mr. G's dissemination of Bridge99 concept around the company was an effective way. Figure 5 shows the differences between Bridge99, MIS, and ERP (e.g. SAP R/3).

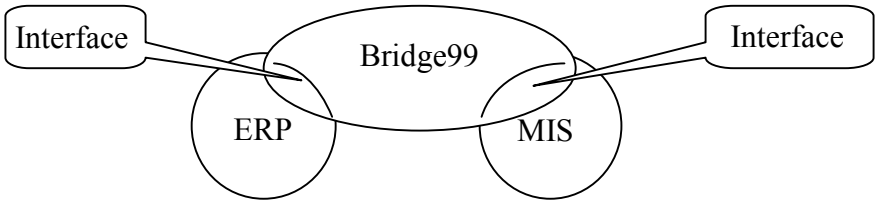


Figure 5. Relations between Bridge99, ERP and MIS

All experts agree that Bridge99 is based on both MIS and ERP, the data sources for analysis. The interfaces between them serve as data transformation gateway. If neither ERP nor MIS has been built at an enterprise, database and knowledge base will store the transformed information. Bridge99 seems to be so powerful that it even covers functions of ERP and MIS. Due to lots of failures in ERP and MIS in China, management experts continually questioned the feasibility of Bridge99. How long would it take to develop such a powerful tool, or even to make out a detailed design, to meet business demands? Was it possible before 2000? Did the computer system design follow the trend while IT developed so fast?

Knowing *Wu-li* is to make clear what is the concerned, which depends on participants' understanding towards the whole issue so as to go out of the dilemma in project undertaking and take steps to find an appropriate technical resolution. Since the experts had different views towards conceptual modeling in Mr. G's methodology, gaps were not shortened after so many debates. Opinions from programmers were often ignored while the gap remained very large between the design and the prototype.

Sensing Shi-*li*- How to fulfill the *right* tasks?

Shi-li points out the framework of managerial tasks of making the best use of everything. By another saying, to accomplish tasks efficiently, to reach the desired outputs with all giving inputs. Figure 6 shows the principal input and output in Bridge99 project.

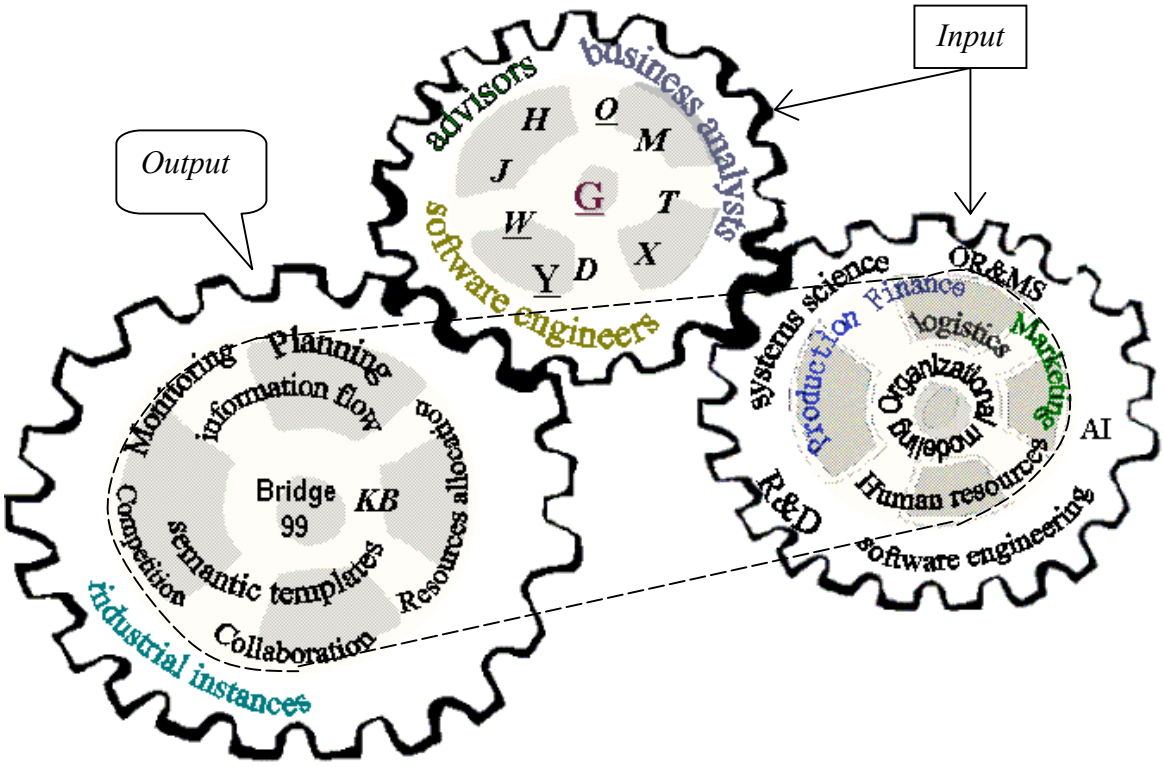


Figure 6. Input and Output in Bridge99 Project

Only knowledge gear cannot drive product gear. Manpower is the largest investment in the project. It is serves as steering gear in the knowledge conversion process driving both from knowledge and product gear (Bridge 99). Initially it was expected that a group of experts with diverse knowledge would propose high quality designs which fit for Mr. G's original thinking in standardizing managerial behaviors within an organization. However, steering gear does not function properly.

Different views towards computerized support for enterprise management affect proper function of steering gear. As mentioned in Section 2, early-arriving experts and late-coming people had totally different views towards those formers' finished designs. Both thought Bridge99 should explore organizational potentials and tell the decision-maker how to increase organization creativity or productivity, instead of another cage for the organization, as most ERP failures in China. However, early arrivals had got the organizational trust and tried to handle the steering gear while late coming people could not follow those 'infeasible' designs. How to resolve the conflicts between them affected the performance of steering gear.

Here the organization of SSD is considered. During the project, experts (designers) and programmers worked at separate group. After the designs were approved by Mr. G, would programmers be assigned for implementation. However, Mr. G was so busy with other business work while Dr. Y seemed lack ability to analyze which design was suitable for

programming work. And Mr. T's authority was challenged by three early arrivals. That was why there were two sets of design for both monitoring and planning modules. High flow frequency of programmers and lack of communication between designers (MG experts) and programmers also deteriorated the situations. The only exception was resources allocation module. Both designer and programmer were in MG. With common understanding towards modeling process, Dr. X and Mr. F cooperated efficiently and finished functional module of Bridge99 before the deadline.

Figures 2 and 3 reflect two different situations in developing computerized support for management in China. Figure 2 shows the situation where computer system concepts are emphasized; so management knowledge is only an input to those systems. In the structure shown in Figure 3, management is the highlight. However, Figure 3's framework did not work due to messy human relationships and office politics. All those part-time experts were recommended to the Group by their advisors or colleagues, who were top scientists in their research fields. Knowledge structures, academic training and personal characteristics of those part-time experts affect their collaborations. The role of Mr. G also affects Mr. T's work in MG. On one hand, Mr. G is a member of MG for Bridge99 design; on the other hand, Mr. G owns exclusive authority to explain his own methodology. Mr. G's paradoxical attitude toward those experts affects the whole work.

Considering Nonaka's framework for knowledge creation, we owned 4 out of 5 organizational conditions: i*ntention* - Mr. G's continual pursuit for specialists to implement the project and experts' ambitious imagine of Bridge99; *fluctuation/chaos* - the critical deadline for Bridge99 and pressing demands from consulting people who kept on forwarding requirements and opinions about the finished designs; *autonomy* – each member in MG developed his own ideas about Bridge99 and design for one function with great freedom; those ideas and designs quickly diffuse within SSD through weekly meetings and then stimulate others' thinking and designs; and *redundancy* - Mr. G's endeavors in dissemination of Bridge99 ideas among the company; experts in MG also joined consulting department for practical projects that facilitated mutual understanding between project researchers and business analysts. However, a wonder did not appear before the deadline.

Seemingly best experts involved, their advantages were not effectively exerted, and their appropriate knowledge was not applied to appropriate issue at appropriate time. Lack of authority to facilitate collaborations between those experts led to low efficiency. Mr. G could not devote all time to Bridge99. Dr. Y was unworthy of his position; his continual re-structuring SSD for office politics led to destructive conflicts. Some self-organized small groups misapplied trust as a privilege and broke the harmony in SSD. The specific leaderships of the company, human resources management and the organizational culture affect appropriate deployment of the part-time experts. Those are issues on *Ren-li*.

Caring *Ren-li* – *Shall we* go this way for a smooth implementation? Or that way for better outcome?

Basically, *Ren-li* is to make the best possible of human beings and to manage in exploring human's potentials. Obviously, the messy human relationships affected normal working process of Bridge99 project. The organizational attitude toward Bridge99 was also in question. Here CATWOE analysis was taken to have a detailed scenario of the whole project. Created by Checkland (1981), the mnemonic word CATWOE denotes six elements (*customers*, *actors*, *transformation*, *Weltanschauung*, *owners*, and *environment* constraints) which should be considered to understand the observed system and build the concept model.

***C**ustomers* refer to victims and beneficiaries of what the system does. Here refer to consultants at project development department in Bridge Group and their potential clients. During Bridge99 development, the Group got some consulting projects in telecommunication, retailing and a stock company. So semantic template representation about business organizations at different sectors would have to be considered. Strangely, experts were asked to design based on manufacturing industry.

***A**ctors* refer to those who carry out the system activities. Then all members of the Bridge99 development, including MG members, programmers, G and Y. Figure 3 indicates the relationship between main actors, where self-organized groups existed beyond the administrative unit and fought for leaderships of MG.

***T**ransformation* denotes to the purposeful activity which transforms an input into an output. In this project, we have knowledge gear and manpower gear as the original inputs and expect Bridge 99 package and its instances in practical projects as the final outputs. The steering gear (manpower gear) drives the transformations, which are summarized as five levels of activities, as shown in Table 2.

Level	Transformations	Actors	Issues in Implementations
1	Methodology → functional modules' design	G, W, H, J; T, X, M	Academic based vs. business driven; R&D project vs. business applications;
2	Business process → semantic template representation	T, other knowledge engineers	Time-consuming work with much complexities; lack of manpower
3	modules' design → computerized system design	D, J, M, T, X	Specific knowledge for specific tasks; integrative knowledge for integrative design
4	system design → software package (Bridge99)	D, X, F, O, other software engineers	Organizational limitations on effective teamwork; lack of initiative thinking and necessary experiences
5	Bridge99 → practical instances	Consultants on project development	Gap between methodology and final product

Table 2. Transformations in Bridge99 Project by CATWOE Analysis

Different knowledge matches different level of transformation. The *actors*' knowledge capacity decided their performance about those transformations. As Internet develops so fast, enterprise information portal (EIP) and enterprise knowledge portal (EKP) have emerged to provide business users with single web interface to corporate information and other analytical processing, such as business intelligence (BI), etc.(Firestone, 1999) As to practice style, application service provider (ASP) gradually became the trend in IT industry while neither D nor O noticed the trend. The capabilities of SSD to undertake those transformations were immature. Evidently, Bridge99 was out of date after 2-year delay; similar products have been issued.

W*eltanschauung* denotes the world view which makes it meaningful to consider the system. It is only Mr. G whose scholar-like leadership in the Bridge Group and eager to apply his own methodology in management consulting in China make it possible to start such a project. That was Bridge's culture. That was why experts were respected so deeply due to their academic background within the company.

Outsourcing is another culture in Bridge Group. However, the evaluation of outsourcing work is not practically applied in time. So the performance of experts was different. Even chaos and fluctuations are regarded as one of enabling conditions for organizational knowledge creation, it is necessary that the core members within the organization for the concerned knowledge-creating project be stable and then can devote completely to the project in Nonaka's framework. Moreover, they hold necessary authority to direct the knowledge conversion process. Due to part-time experts system, either MG or SSD lack maturity along whole Bridge99 developing process. Obviously, SSD is only at the initial level of capability maturity model (CMM) for software developing process (Paulk, et al. 1993).

Adoption of a foreign manager to improve management level and decrease complexities in human factors reflects Group leaders' global thinking. Communication is important for cross-cultural understanding and effective management. Due to his limited knowledge capacity and disadvantages in character, Dr. Y did not undertake effective communications with the majority, and then led to destructive conflicts. Is that still due to oriental culture even Dr. Y has been working long in western companies?

O*wners* refer to those who can stop the activity. The Group is the only owner. As a matter of course, only the president of Bridge Group can stop the whole project. Some experts for effective system design work are also owners. The instability arosed by the absence of part-time experts led to abortion of modules in Bridge99.

E*nvironmental constraints* include the things in its environment which this system takes as given. Both internal and external factors affect whole process of the project. External factors refer to large enterprises software market and few competitive domestic products, another ERP tide in China, demand in the operation and management modernization for the sake of global competition. Internal factors include actors' capabilities to understand computerized enterprise management support, knowledge structures of teamwork and

individual expert, conflicts between personal ambitions and group's objectives, conflicts between academic based design and business oriented work, lack of market investigation. Disharmony within MG brought more blockages during project implementation.

What we really need is a balanced power to drive the knowledge creation gear set work properly for successful project implementation. In reality, such a balance was not reached due to problems in *Wu-li*, *Shi-li* and *Ren-li* and their unsuitable interconnection. Even though Mr. G kept such a project, old concepts with new saying like Bridge 2000 implied wrong assumptions. Unavoidably, the gear set was broken down.

CONCLUSIONS

Above analyzed an enterprise software project using the oriental WSR system approach. Even though both system approaches and WSR ideas had been recommended by one senior advisor, they were only applied under limited influence and ignored by middle-level managers during the project undertaking. Negligence of proper methodology and messy management led to high input and low outcome. Even though problems in human resources management could be among the reasons for failure, inappropriate views toward relations between R&D, enterprise management and its computerized support tool and organizational knowledge creating process were the key factors. Soft system approach is helpful to establish right views so as to do the *right* thing. In such a case, there were so many typical problems in *Wu-li*, *Shi-li* and *Ren-li*. It was so difficult to reach a satisfactory resolution toward the whole project implementation without effective endeavors between three *li*s. Here are some issues came from the project worth further discussion.

- Differences between academic based and business driven projects;
- Uniform understanding of the project goal;
- Appropriate incentive system for effective performance during knowledge conversion process;
- Appropriate deployment of knowledge for problems, and appropriate knowledge structures and effective teamwork in project implementation;
- Comparative system practices of eastern and western management ideas;
- Culture analysis in the resolution of issues;
- Organizational capability maturity for integrating different levels of knowledge;
- Interdisciplinary understanding and a learning process of problem-solving.

Advanced as computerized support tools for decision-making are, they should be neither academic products nor simulation of the ready system. Creative framework is required which calls for system thinking to the observed system. Human factors must be included to draw practical and effective scenario(s) of the system. As IT advances are being extensively applied to every facet of human's life, right approach to the intensive information support and its computerized implementation is critical for a satisfying result.

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