

Another modeling approach: using novice to do the job

Courage to take risk and you will have a star!

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Abstract

Including a professional modeler to establish a profound and reliable model is always a regular way to do the job. But sometimes we don't have the chance to get all the necessary resources. During the project modeling process, we meet abnormal challenge and also have chance to find other way to reach the goal. The most important part is we use a novice to establish the model. In order to overcome the obstacles we would meet. We just use many ways to support the modeling work. Finally we just complete the work and win our agent's confidence to ask for our next proposal to establish another model. The purpose of this study is using qualitative research technique to share our experience to all meet the same challenges. We found that both external and internal structures are very important to success. We concluded some topics related to these two direction findings and also propose some limits for further study.

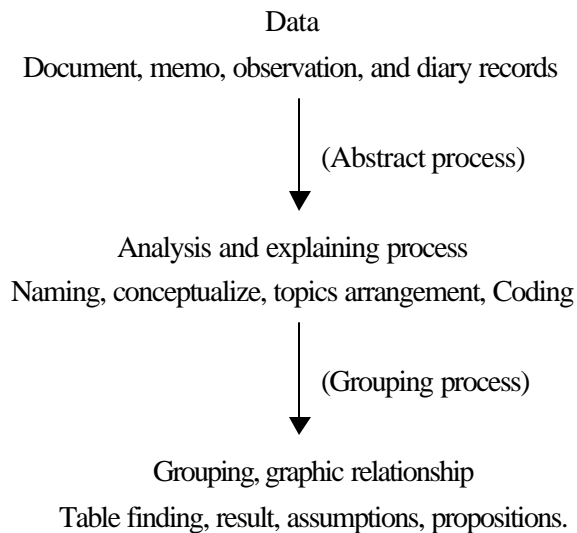
Background: Successful model building process

There are many papers described about successful model building process (Gröbler, A., 2000; Hines & Johnson, 1994). Some of them also create other way to make the model (Graham & Walker, 1998). All of the papers described modeling process would include important elements (Randers, 1980). Modeler (Randers, 1977), Interaction between modeler and agent, and group modeling (Akkermans, 1995; Akkermans & Vennix, 1997; Andersen & Richardson, 1997; Andersen et al, 1997; Lane, 1993; Wang, 1999; White et al., 1994) are frequently appeared topics in the magazines. Many of them emphasized the necessary of the experienced modeler to make the model. But if the situation is not assure for the experienced modeler to make

the job, would there be any method to continue the modeling project and also succeed? Before becoming an experienced modeler, everyone is a novice. The traditional way to train a novice is require he to model at least two projects: an existed simulated like People Express and a real world (company). The real case always is no-paid project and made for academic research. Of course the quality of the model is not so good. However, there are less time our busy experienced modelers have and the real project win the real attention and effort. Could we take less time from the experienced modeler and also train a novice into a better modeler? How could we combine the training process with the real model project? This study tried to look back from our project experience. To look for the elements that must exist when we want to use a novice to model a real project. We would also discuss the dark sides that would appear when novice does the job and suggest some methods to overcome it.

Research methods: Qualitative research process

This study use qualitative research process to share our finding. Basically, the components of the qualitative analysis include: data, analysis and explaining process (especially coding process), and presentation (Becker, 1970; Charmaz, 1983; Lofland, 1971; Miles & Huberman, 1984). The qualitative research process could be showed as picture 1.



Picture 1: qualitative research process
Arranged by this study.

Our evidences came from the arrangement of the memo, diary, or the observation from the advisor. Using 'ground theory' data (time schedules, documents, memos...) to support this kind of claim or opinions. Using case practicing experiences to do the qualitative research. To arrange the overall topics experienced in this modeling process of Tai-power project and see what topics will emerge when I put them all together.

Concept is the major part of science. When we give a phenomenon a name and construct a concept for the phenomenon, we then could continuously pay close attention to the phenomenon (Blumer 1969, pp.153-182). Then we categorize these concepts into a few groups and give each group a name. Each group has some familiar characteristics.

Qualitative research approach: Content analysis

Following the previous qualitative process, we arranged the original data, look through related issues, items, ideas, components. Then we named for the important concepts and group these concepts into four groups. Each group has similar characteristics.

I personally think the priority will be the order of guiding structure, frequently agents interviewing, personal characteristics, and then personal modeling abilities. The former two are about the structure level approach. It could make sure the modeling direction would be control by the project manager. The latter two would decide the detailed quality of the project. The grouping is showed in table 1 and would be described more detail as follows.

Table 1: grouping of important concepts

Main item	Guiding structure	Frequently agents interviewing	Personal characteristics	Personal modeling abilities
Second item	<p>Roles in the modeling process</p> <p>Team network</p> <p>The project manager must have the courage to takes some risks</p> <p>Routine team meeting</p> <p>Multi-round modeling consensus</p>	<p>Keep the relation</p> <p>Interaction between model team and client</p> <p>Modeler's position positive loop</p> <p>Trade off accepted by agent: Get most priority: even cost less</p> <p>Calibration, verification, and consumer-oriented</p> <p>in harmony with agent's Organization culture and communication style</p> <p>Multi-round modeling consensus</p>	<p>Lesson the pressure.</p> <p>Forget.</p> <p>Look through different angle.</p> <p>Have religious belief or practice sitting in meditation.</p> <p>Every time is a good chance to modify your model.</p>	<p>Developing from the doing</p> <p>Energy focus on one job</p> <p>Self-reflection of the new learner</p> <p>Stay in one place</p>

Guiding structure

Our project uses a team form to do the project. The guiding structure would discuss mainly on the topics with in the modeling team.

Roles in the modeling process: guildler, discuss partner, and test partner

There must be an experienced 'teacher/guildler' beside the new modeler or the novice would lack the direction. There must be a person you can talk to for discussing. Not the teacher, but the friend or modeling partner.

More playing would find more errors. There also must be some model testers to test and play the model for you to find out the bugs the model might have. The roles would be arranged in table 2.

Table 2: three roles

Roles	Functions
Novice modeler	Build the model
One teacher	For catch the critical structure
Other partner and consulter	Give suggestions , possible ideas, and concepts, but just for references, the modeler can even ignore their words to be suitable for use.

Team network

Different network produce different information that produce different action strategies. Our interaction includes routine and evolution types.

Routine type: Every Tuesday/Wednesday noon meeting

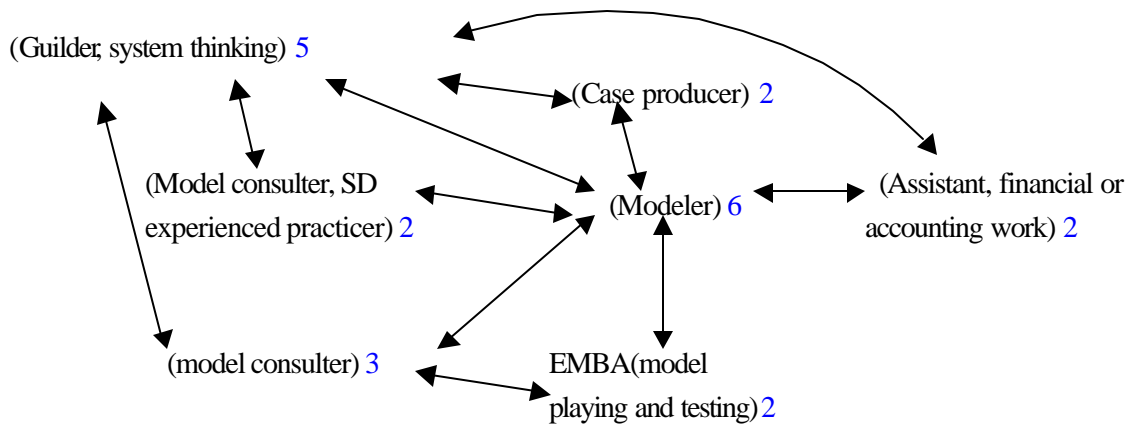
The novice, teacher, and partner shared and analyzed interview records and oral history data. Trying to find out the deep insights.

Evolution through time

First stage. 3 teachers and three assistants met together to win the project and set up the initial modeling process.

Second stage. We use more than one year to do the project. Through the project period, the modeler, guildler, and partners (case producer- our project also want us to offer related cases for references, model consulter, people help play and test the model) discuss and meet together as long as they have to by e-mail, telephone, and meetings.

The novice modeler almost discuss with each role. In our project, he has almost six linkages with other team members. The interaction network of this stage is showed in picture 2.



Picture 2: stage 2 network

The project manager must have the courage to takes some risks

If you don't let them try, there will be no stars. No one suddenly comes to become a star without any failure or learning experiences. There must be some knowledge cumulating process in the learning process of the new modeler.

Multi-round modeling consensus

There never be one time success, must come and return for several (2~3) times to get the model better and better. Before the project begins, modeler and client must have a consensus that a good model comes from a good understanding of the mental model of the structure. Better understanding of the mental model would take some time. Multi-round modeling would be a good choice to take and novice could also benefit from the process by deeply understanding the context of the structure and being familiar with modeling techniques.

Frequently agents interviewing

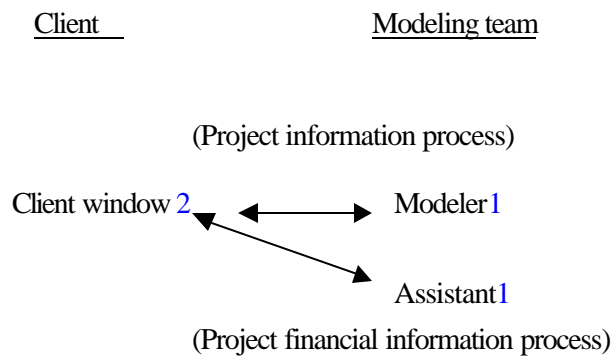
Keep the relation

Most importance, keep the relation with client members for the chance to deepen your understanding about the area.

Interaction between model team and client: there types

Routine team meeting

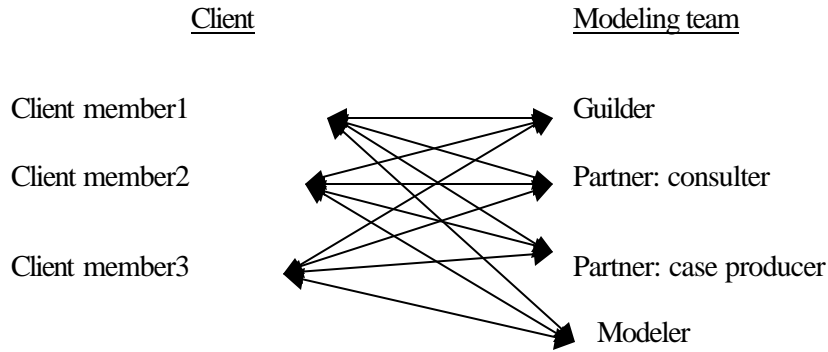
Our modeling team communicates with one client member to exchange model and financial information. The interaction is showed in picture 3.



Picture 3: Routine interaction

Medium and final report/ presentation/ discussion

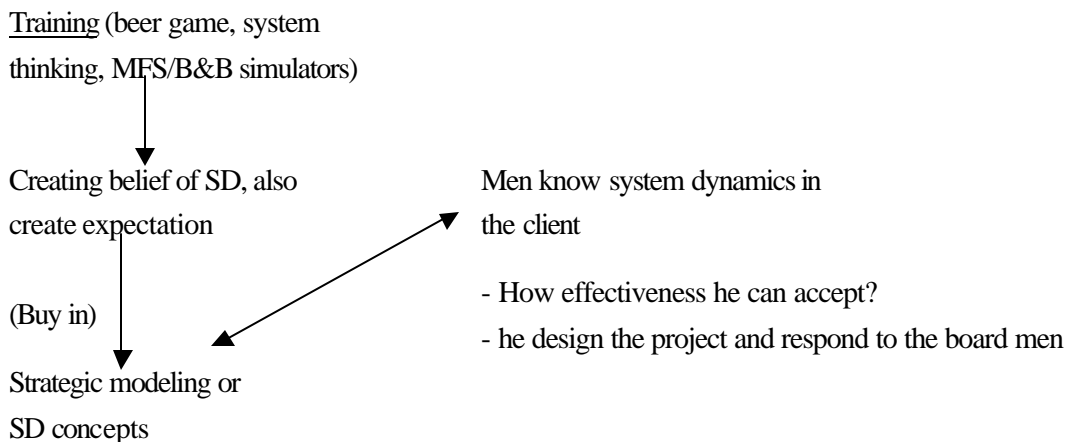
Our team members talked directly to client members. And exchange all information at these times. The linkages between us would be n (modeling member numbers) multiply m (client member numbers). The report interaction is showed in picture 4.



Picture 4: Report interaction

Buy-in process

All of the project must pass the final report that is checked by the client. We hold many training courses to get the member being familiar with the system thinking concepts, modeling playing, and system dynamics tools. And we also cooperate with people already known system dynamics to prompt our client accept our model. The interaction is showed in picture 5.

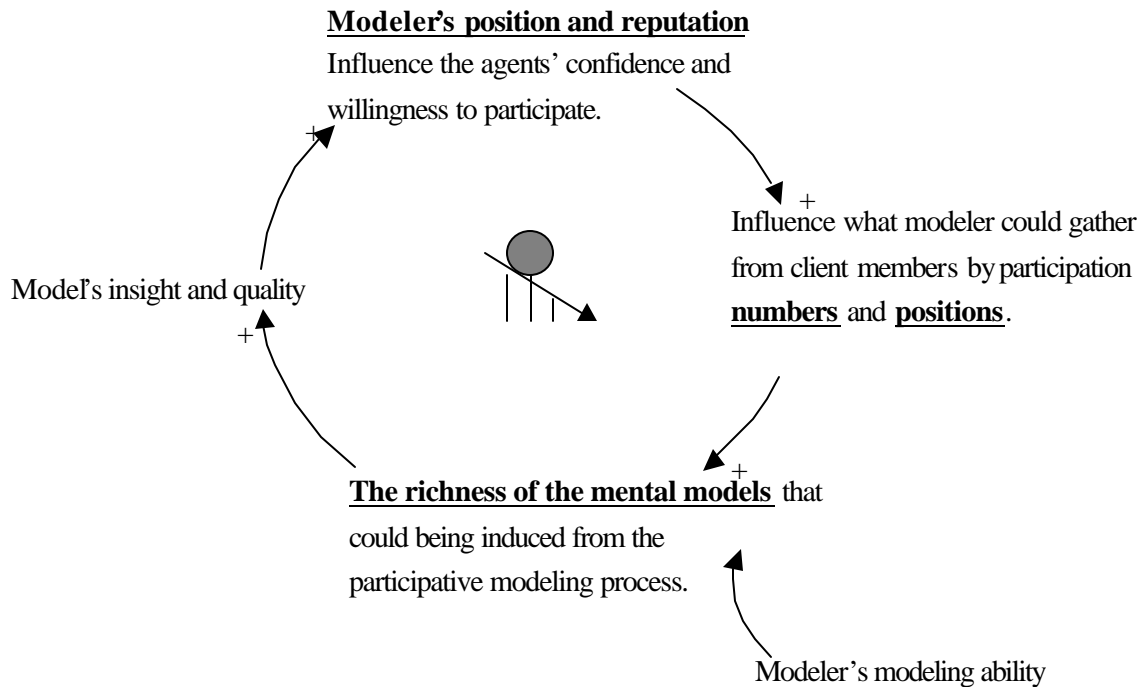


Picture 5: buy-in process

Modeler's position positive loop

In the normal meetings, there is fewer client company staff came. Each time there is only one or two department members came. We always talked too fractional and too

detailed in each department's mental model about its story not the whole company's big picture story. Only in medium and final meetings, when professor guilder came, nearly all related departments then sent members to participate and discuss. Then there might be a positive loop in the modeling period. That is higher position member touch with client, higher client member position we could meet. Then richer data we would get and better model we would build. The positive loop is showed in picture 6.



Picture 6: Modeler's position positive loop

Trade off accepted by agent: Get most priority: even cost less

You can spend less money or resources to get more assistance, help, or services. The new modeler might spend more time in discussing the modeling project, and he will put the modeling project as the first priority.

Calibration, verification, and consumer-oriented

The most important part of the interaction of the modeler and the client is to make sure the model reflect the reality. Beside the normal model test techniques like history behavior match and mental model behind the structure that describes the reasons of

variable behavior pattern such as why maintenance expenses behave like this, our client might ask us using year to be the simulating unit time, not use season. That's because our client only offer year numbers. Such kinds of actions would increase the probabilities of understanding about the model and design the model to fit the client's need.

In harmony with agent's Organization culture and communication style

Be sure you accommodate yourself to the culture and communication style is very important. You must be or let them feel you are one of them. That would make your data gathering action more smoothly and you would get deeper information from them. In our interaction with client, the familiar with rule, understanding client members' responsibilities, be striving, and need then ask is the main characteristics of our client's organizational culture. Casually discussion and easy words taking is necessary in communicating with each other. The arrangement will be displayed in table 3.

Table 3: Organizational culture, communication style, and corresponding actions

Organizational culture and communication style	Corresponding actions
What the organizational culture (bureaucratic) is	1 Meet every rule that show in the contract 2 They who involved must pay the ir responsibility to it. Because our project is a cooperating contract, that make they have to be responsible for it. So you had better do what ever they want you to do, and show them you really appreciate what they contribute by changing the product as they ask 3 If they want the 'effort' you do, make them feel that you work hard meet them often, discuss face to face, no matter they are too busy or not. 4 They won't cancel the project, so do not touch the extreme urging them to do so. 5 Need then ask style of cooperation. If they were too busy, they will watch what they knew. Team members go in and out, knowledge can't deep in. You must know what you want know and find the right man to ask. The meeting must be held if it is really necessary to gather all the data from all the people. eason comes from official or formal structure design and job descriptions.
Communication style: when you discuss.	Use the friendliest words for them to understand, or they will look for the most trivial thing to challenge you. Discuss more casually, not let them feel pressure.

Multi-round modeling consensus

There never be one time success, must come and return for several (2~3) times to

get the model better and better.

Personal characteristics

The new modeler must have or develop special personal characteristics (versus experienced modelers) including courage, fortitude, responsibility, good heart, and most importantly have religious belief or practice sitting in meditation.

Lesson the pressure

The novice must have lots of pressure comes from less modeling experience. The new modeler must learn something like:

Forget. If you could not bring about a help thought, go out for fun, forget all things, and forget the model. Pressure would deteriorate the situation that the new modeler meets. You must learn step by step and also expect yourself to grow with this kind of pace. Man easily fell into one-step concern and want to reach the best, but that can make you dieing.

Look through different angle. It's a chance to grow, not a time to disappear a capable new system dynamics modeler. New modeler must have courage, fortitude, and talked to yourself even you loss, you won't really loss, you are just the winner, because the new modeler learn and grow from the process.

Have religious belief or practice sitting in meditation. Situation never go as you wish and accident is the normal friend. Believe the God, but be prepared. Put down your insistence, there will be a whole new order guiding you to go or grow. Keep your responsibilities as the modeler and do what your could do to make progress. Each little steps would cumulate into a big success.

Every time is a good chance to modify your model Reflect from each discussion or agents' requirement and think what it related to model. That could be the chance to improve the model. The new modeler must have a good heart, look things through positive side, and believe the critics is the effort people make to get things better not the action to heckle you.

Personal modeling abilities

The major special feature of the novice modeler is that he grows and get familiar with each model-building techniques through the process. Each person has his unique abilities and characteristics. The novice must do and reflect at the same time to carefully refine his actions.

Developing from the doing: knowledge deepen and accumulating process

There is always no other better way for modeling ability to be developed from real doing. It's a creative process to turn the external knowledge into internal knowledge. The model error comes from the un-simulating scenario. Never be afraid of making mistakes. It the chance to learn and become a elite.

Energy focus on one job and on the topic

If you are a modeler, don't do the accounting job. Be focused. How do you become a better modeler and also get familiar with the system dynamics related methods and tools? You only have to read the pages familiar with your project needs. Start from the index and catalogue to look for the useful messages and read them. Don't spend too much time read other not so related pages.

Self-reflection of the new learner

Novice must learn from doing and also think at the same time. Take down the notes as you bring about an idea from your mind (brain), to live with the reference, find the most related papers, and search through these papers' references to expand your database. In the modeling process, it requires independent study ability. So novice must reflect frequently to himself what I have done and what I would do later.

Stay in one place

Conceptualization, calibration, and verification all takes long time and energy to finish. So you must stay in one place to focus your time. Stay there, even you do nothing but wandering. That would make the novice to produce at least little things and that is the foundation to cumulate big work.

Think both through system thinking and flow-rate concept

How to start modeling through the project? You could begin with the flow concepts (Kotler, marketing book 11th edition) or system thinking casual loops. We try to compare the good and bad between them in table 4.

Table 4: good and bad between system thinking and flow-rate concepts

Approach	System thinking	Flow-rate concepts
Comparison	<p>Suit person who lack mathematics background</p> <p>Approach: find key variables, relationship, and transfer to mathematical model(in the transferring process the distinguish between level and rate variables is very important)</p> <p>Easily to communicate with agent in the early stage when the agent also lack the mathematics background</p>	<p>Contrary</p> <p>Look exactly through real flow of materials, information, policies. Then just use the mathematics to describe the reality.</p> <p>When the agent familiar with mathematics, start with this could prevent the black box paradox. The process could make the model more white box as possible.</p>

Discussion

Using the novice to model a project is very difficult as Sterman (2000) has mentioned. But we must admit there are not always situation as we want. Sometimes we just have to use some abnormal way to reach the same goal. Through the arrangement of the project we found some characteristics that might be concluded into some assumptions to help the future research to give more evidences and as the basic to get some improvements. Our assumptions could be stated as follow:

Infrastructure and modeler quality both important

From the modeling process we could observe that the external structure of guild and agent is as important as internal disciplines of the modeler.

The benefit of using novice: Win (client)-win (modeler) situation

Through the new modeler modeling process, there will be long-time loyalty and relationship established between the se two parts. Even you only have to spend less for the network.

Use team to pass through the dark sides

The new modeler may lack significant attention to the important points of the

process. So modeling team is important in the group modeling process. Team also would make novice overcome obstacles comes from conceptualizing interview data and negotiating through defensive routine of the organization culture and policy system.

Conclusion, research limits, and future research

From this study we suggest some kinds of external structure and internal disciplines when using novice to build a model. Using team to get through the model-building process would get the win-win situation. But we also must admit that the study has some shortcomings might be improved. That could be the classification method, the timing of notice the external structure and internal disciplines, and system-thinking trap.

The classify is very subjective

I just classify all my observations into four groups that may simplify our understanding of this topic. May be using other classify methods we would conclude into other assumptions. But under this classify type we still have much confidence that this conclusion still be useful to improve our application effect and understand of the topic.

The timing of notice the external structure and internal disciplines

We must admit that the process of developing a new star (hope) must know the timing that what elements running the process should notice. What variable should collocate with each other at when? That still need further study to understand.

System-thinking trap

Would we meet any kinds of positive loop, negative loop, or time delay through the process? Since we have find out the elements when using novice might meets. The next step is to look for the system-thinking traps we might meet when going through the process. System thinking loops might give us more guidelines to follow and give us more chance to successfully complete the process.

All of the topics proposed would be further studies from now and might give more chance to develop more good modelers and produce more better models with deep insights.

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