Exploring Some Dynamically Aligned Principles of Developing a Balanced Scorecard

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Abstract

The Balanced Scorecard (BSC) facilitates managers to balance strategic focuses on four perspectives, on complex cause and effect relationships, and on developing more systemic aligned strategy. But some literatures showed that the BSC theory and practice had some limitations. The root of limitations is “cause and effect are not closely related in time and space”. And that will mislead managers to generate misperceptions of feedback information and execute wrong strategy. This research employs system dynamics as a method to overcome the limitations, and focuses on generating some dynamically aligned principles for the theory of developing BSC with system dynamics. We perform a case study on a hospital (K Hospital) in Taiwan, which using BSC to develop strategy, and we use systems thinking and system dynamics to inquire its BSC strategy. We generalize some dynamically aligned principles, including using the dynamic pitfalls to inquire a BSC and remind managers abidingly, and propose some critical dynamic structures to diagnose problems and generate solutions. These principles could facilitate other organizations to inquire their BSC and to develop their new BSC strategy. We suggested a more dynamically aligned BSC for the case hospital.

Keywords: Balanced Scorecard; System Dynamics, Case Study; Generic Structure; Dynamically aligned principles.

Introduction

The Balanced Scorecard (Kaplan and Norton, 1992, 1993, 1996ab, 2000ab, 2001ab) is not just a performance measurement system, but it is a strategy management system that can facilitate managers to find performance drivers, to explore and describe strategic action map precisely, to implement strategy effectively, and to learn from the circular process.

The BSC facilitates managers to balance strategic focuses on four perspectives, complex cause and effect relationships, leading and lagging indicators, and tangible and intangible indicators, and to develop more systemic aligned strategy. But some literatures showed that the BSC theory and practice had some limitations. Akkermans and Oorschot (2002) advocated five limitations to BSC development. The limitations were “Unidirectional causality too simplistic (Nørreklit, 2000)”, “Does not separate cause and effect in time (Nørreklit, 2000)”, “No mechanisms for validation”, “Insufficient between strategy and operations”, and “Too internally focused”. The before-mentioned concept concerned that the cause and effect linkages of developing BSC would generate the dynamic complexity. And they proposed the theory of using system dynamics as a method to overcome the limitations to current BSC theory and practice.

After reviewing some literatures about the theory of developing BSC with system dynamics (Akkermans and Oorschot, 2002; Schoeneborn, 2003, Solano et. al., 2003), *this research is focused on the theory of developing BSC for analyzing, establishing, and reviewing strategy with system dynamics.* As Figure 1, because the “dynamic complexity level” just described the reality of dynamic complexity, this level could not direct and inquire the BSC strategy development. Although the “system dynamics modeling level” by computer simulation could explore the dynamic complexity and support the BSC development in more systemic view, we could also imitate the theory of system dynamics to develop the “systems thinking and systems archetype level”, *in order to make the systemic insight more understandable and communicable, and less time-consuming.*

Therefore, this research is focused on generating the “dynamically aligned principles” level for the theory of developing BSC with system dynamics. As Figure 1, our objective is from the “dynamic complexity level” down to find some “dynamically aligned principles”, from the “system dynamics modeling level” up to generalize some “dynamic pitfalls, key success factor and structure”, and utilizing the “systems thinking and systems archetype level” of the system dynamics theory to enrich the theory of developing BSC with system dynamics.

By a case study, we build the qualitative and quantitative system dynamics model and inquire its BSC strategy. Then, we follow our previous research result (Young and Tu, 2003) and look over the theory of “dynamic pitfalls, key success factor and structure”. And we generalize some dynamically aligned principles,

including using the dynamic pitfalls to inquire a BSC and to remind managers abidingly, and proposing some critical dynamic structures to diagnose problems and generate solutions. These principles could facilitate other organizations to inquire their BSC and to develop their new BSC strategy. At last, we suggest a more dynamic aligned BSC for the case hospital.

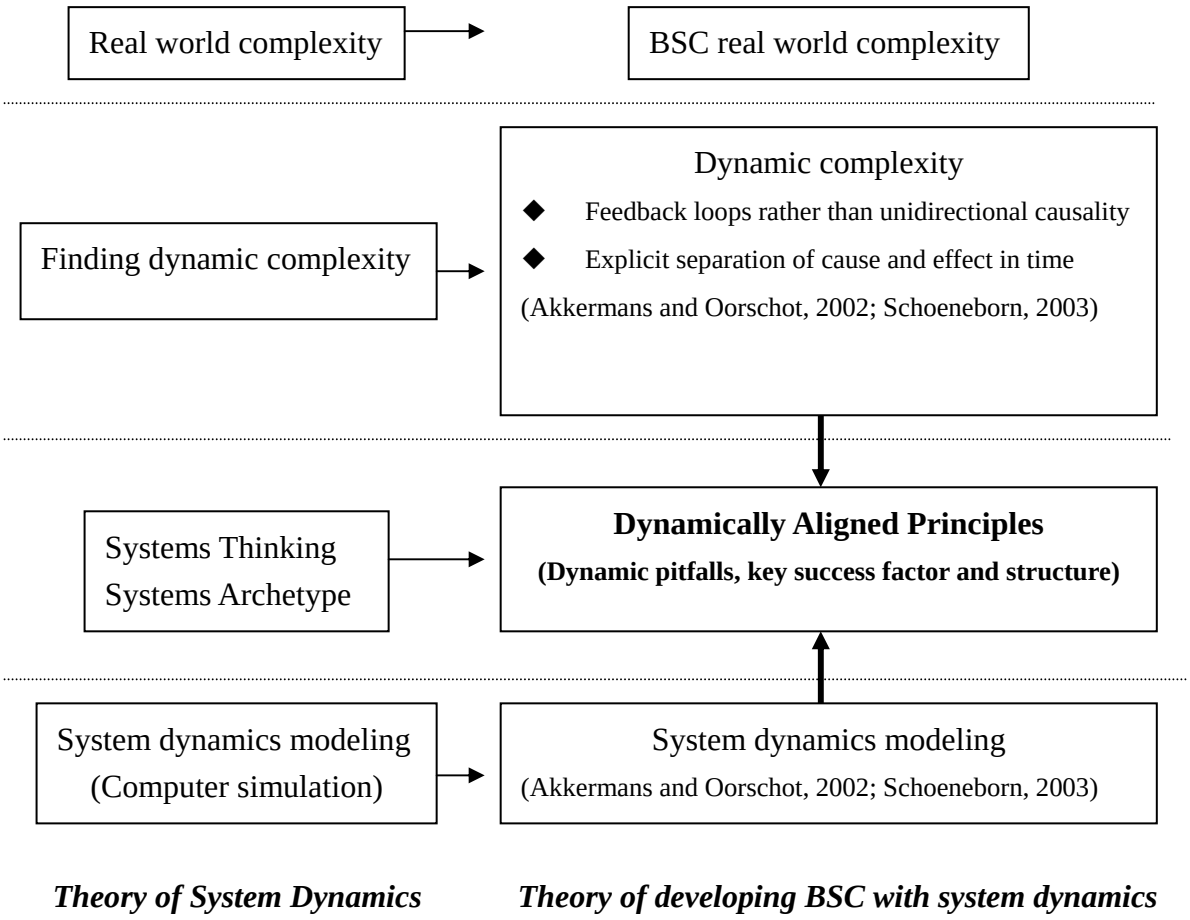


Figure 1: Explore the theory of developing BSC with system dynamics

Dynamically Aligned Principles

The before-mentioned concept, the "systems thinking and systems archetype level" of system dynamics theory, could be originated by system dynamicists searching for generic structures. And in this research, we follow the stream, by exploring some dynamically aligned principles to diagnose problems and generate solutions for BSC development. Sastry (1998) mentioned that "*if we could identify the feedback processes responsible for common problems, and pair system structures and resultant behaviors with each, we could be able to diagnose, understand, and*

even remedy the problems we encounter in social systems", and "*the well-defined and validated set of generic structures would serve as building blocks for system dynamics models, and may provide shortcuts to developing insight into causes, consequences, and treatment of problems*". Lane and Smart (1996) have reviewed some literatures on generic structures and proposed three different views. The first view is the canonical situation models that can be applicable to more than one case, such as Forrester's market growth model (Forester, 1975). The second view is the abstracted micro-structures, more transferable chunks of a simulation model that can be paired with behavior models that they generate, such as a level and a rate which together produce exponential growth (Vennix, 1996: 61). And the last view, they regarded systems archetypes as important contributions for people to understand generic structures. The systems archetypes popularized by advocates of systems thinking through Senge's *The Fifth Discipline* (Senge, 1990).

In our previous study (Young and Tu, 2003), we reviewed some literatures (Akkermans and Oorschot, 2002; Roy and Roy, 2000; Olve et al., 1999; Sloper et al., 1999; Wolstenholme, 1998) and recognized that the dynamic complexity generated by the interrelationships of complex cause-and-effect relationships, trade-offs among multiple objectives and measures, resource and capacity constraints, and time delays. And we believed that the dynamic complexity might mislead the managers to focus on short-term profit not for long-term development, to generate misperceptions of feedback information, and then to perform wrong strategy to allocate resources. The before-mentioned issue must decrease the effectiveness of developing and implementing BSC. Therefore, in order to enhance the long-term effectiveness of developing BSC, we used the feedback loops analysis for a case study and proposed the "dynamic pitfalls of developing BSC" and the "dynamic key success factors" (Young and Tu, 2003) as follows, which facilitate managers to develop BSC strategy.

The Dynamic Pitfalls of Developing BSC

1. The driving force of growth engine is not strong enough.
2. The difficulties of dynamic strategic alignment.
3. Conflicts among strategic objectives.
4. Growth and underinvestment in capacity causes limits.
5. Self-reinforcing feedback loops with time delays increasing the difficulties of resource management.
6. BSC's strategic objectives formulating the balancing feedback loops with time delays cause oscillation and difficulties in capacity alignment.

7. Ignoring the reinforcing feedback loops of causing organizational change smoothly.

The Dynamic Key Success Factors

1. Driving the growth engine needs multiple resources allocation and alignment.
2. Building the reinforcing feedback loops of creating organizational change smoothly.
3. Resource management needs dynamic alignment: antedate to invest in capacity and competence
4. Considering the dynamic impacts of time delays.
5. Using SD to support testing and communicating strategy and to facilitate organizations to experience double loop learning from BSC process.

The above, dynamic pitfalls and dynamic key success factors, is the critical perspective or elements for this research to generate the "dynamically aligned principles level" of the theory of developing BSC with system dynamics. In this research, we follow the above perspective to use the feedback loops perspective and system dynamics method to clarify and inquire the complex systems of developing BSC. Furthermore, we generalize some dynamically aligned principles.

Case Study

Since 2000, the K Hospital was taken over by a private medical institution and had become one of the contracted-out public hospitals in Taiwan. K Hospital attended the "Developing a Learning Hospital Project" (2001-2003) and invited the authors, formed a consultants team, to lead managers exploring and seeing the complex system, and inquiring and reviewing their BSC strategy.

We collected primary data by conducting some workshops and recording the data which surfacing, including financial performance of K Hospital, 2003-2005 BSC, interviews with managers, middle level leadership workshop, all members' discussion of three most threatening issues, and conducting the management team meeting by using systems thinking and system dynamics to inquire K Hospital's system and its BSC.

The financial performance of K Hospital was summarized as Table 1. In 2002, the K Hospital had developed the balanced scorecard for 2003-2005 as Table 2.

Table 1: K Hospital financial performance

	2000 2/1-12/31	2001 1/1-12/31	2002 1/1-12/31	2003 1/1-9/30
Revenue	7,981,674	117,343,448	256,105,048	245,860,456
Less: Operating Cost	3,556,684	37,893,966	79,967,905	82,982,830
Gross Margin	4,424,990	79,449,482	176,137,143	162,877,626
Less: Operating Expense	22,038,836	107,558,870	202,429,917	193,439,429
Operating Income (loss)	(17,613,846)	(28,109,388)	(26,292,774)	(30,561,803)
Net Income (loss)	(17,445,755)	(26,065,514)	(22,304,271)	(21,827,211)

Table 2: 2003-2005 K Hospital BSC strategy

	Objective	Measure	Action Plan
Financial Perspective	2003 balance revenue and cost to break-even point	1. Revenue 2. Patient-provided income 3. Contribution per department 4. Revenue per employee	1. Increasing operating activity 2. Analyzing cost and contribution for each department 3. Increasing operating revenue 20% 4. Enhancing revenue per employee to NT$140,000 5. Decreasing part-time doctor ratio 6. Expanding new services and patient-provided income
	2004 create 2% net profit rate		Increasing operating revenue 15%
	2005 create 5% net profit rate		Increasing operating revenue 15%
Internal Process Perspective	Ensure service quality and expand service networks	1. Emergency room transfer rate 2. Process computerize degree 3. Outpatient operation to total operation	1. Decreasing emergency room transfer rate 2. Improving service and clinical process 3. Expanding new services and patient-provided income 4. Redesigning the building space 5. Building outpatient operation process
Learning and Growth Perspective	Make employees become leaders	1. Percentage of employee being able to handle direct patient care problem 2. Manager's work lord 3. Enhancing doctor's capacity 4. Enhancing employee professional skill 5. Number of new services	1. Building the learning climate, leading by vision and value 2. More authorization 3. Managers should allocate 10% time for caring their staffs 4. Participate the Learning Organization activity 5. Enhancing and training medical professional skills 6. Training hospital management professional 7. Maintain excellent employee

Continued Table 2: 2003-2005 K Hospital BSC strategy

	Objective	Measure	Action Plan
Customer Perspective	Create new value for customer	1. Number of services recognized and eulogized by customer 2. Customer satisfaction (outpatient, inpatient, emergency room patient) 3. Number of allied clinic 4. Average patient visits per week 5. Market share	1. Employees creating innovative services collectively 2. Enhancing customer satisfaction 3. Expanding new services 4. Strategic alliance with outland clinics 5. Enhancing the patient visits 6. 2003 five services to 75% market share 7. 2004 five services to 80% market share

We generalized the above and found K Hospital's strategy theme as follows.

1. Improving financial situation.
2. Expanding new services.
3. Increasing operating activity.
4. Expanding market share.
5. Enhancing customer satisfaction
6. Ensure and enhance service quality
7. Enhancing employee professional skill
8. Maintain excellent employee
9. Enhancing doctor's capacity
10. Decreasing manager's work lord
11. Leading by vision and value

Applying System Dynamics Inquiring the BSC Strategy

We conducted a workshop to lead K Hospital management team mapping the (2000-2003/10) key performance indicators' patterns (as Figure 2) and cause and effect relationships. We connected the above with the data that recorded and distilled from the processes of previous workshops and interviews. And we summarized the above and presented the case study as follows.

K Hospital expected growth model

As Figure 3, K Hospital's managers had their own mental model of expecting hospital's growth pattern. The growth logic was utilizing financial resource and investing on new services, and clinical process and quality improvement. The more

investments could much more enhance customer satisfaction and bring new customers. And then K Hospital could gain more financial resource for reinvestment. The above strategic logic was expected to drive hospital's growth.

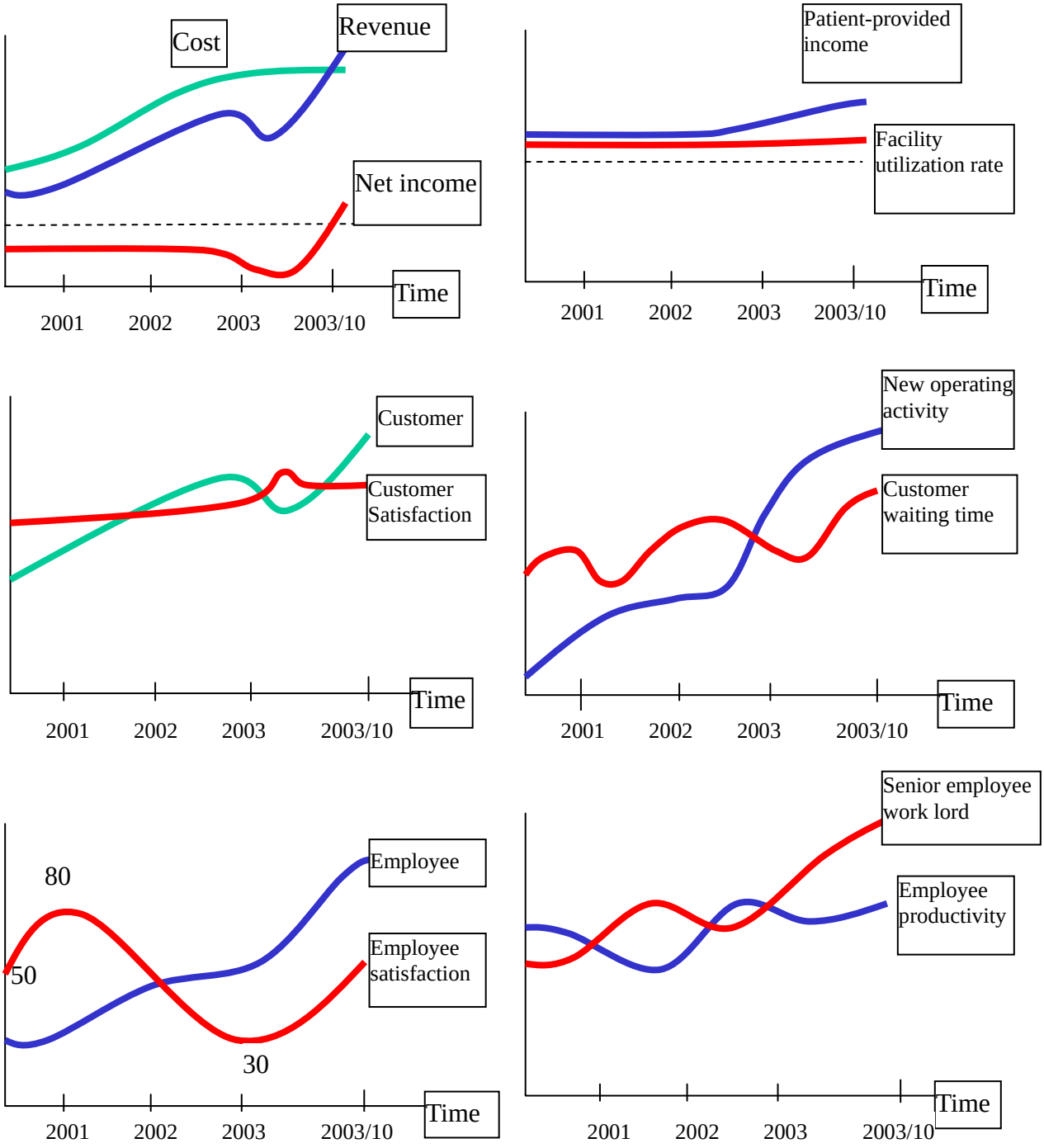


Figure 2: Key Performance Indicators' Pattern

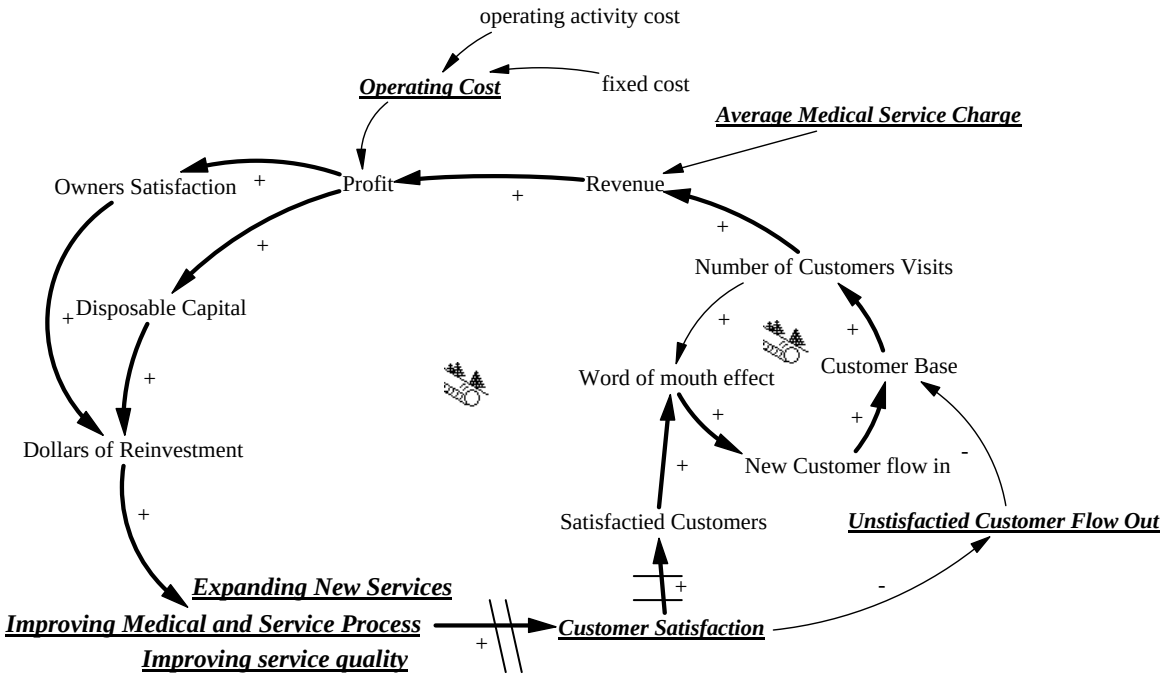


Figure 3: K Hospital's expected growth model

But the reality is ……

According to Table 1 K Hospital financial performance reported operating loss continuously. Why was this happened? And what was the consequences or side effects? We explored these issues and discovered some structural explanations.

1. Three years loss caused financial pressure

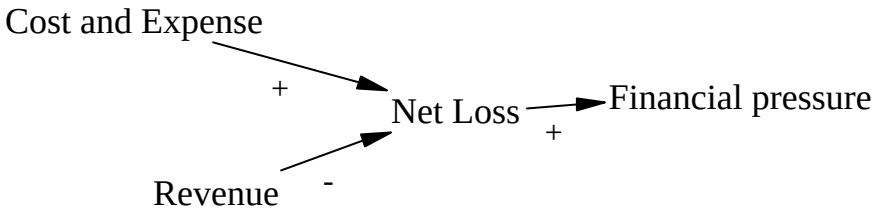


Figure 4: Cause and effect of K Hospital's net loss

The continuous loss, for almost three years, caused by operating cost and expense exceeding revenue, and resulted in the growing financial pressure (as Figure 5).

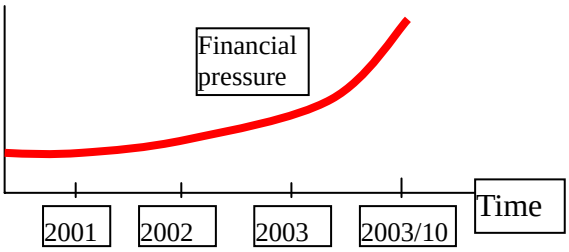


Figure 5: Pattern of financial pressure

2. New service projects for increasing revenue and decreasing loss also caused expanding cost

Why wasn't the financial pressure eased? 1. As Figure 6, financial pressure should have been eased by the negative feedback loop, but the cost expanding positive feedback loops which causing much more expenditure in a shorter time drove the lasting loss and financial pressure. 2. The time delay from bringing into hospital to creating benefit, including equipment investment and human resource investment, is much longer than cost expanding. As cost expanding, there was a longer time delay from promoting new projects to bringing new customers. Therefore, the financial resource flow-out (cost) exceeded flow-in (revenue). 3. Besides the time delay caused the new customer flow-in not expanding enough, the dilatory customer growth rate, recently, caused by customer flow-out increasingly.

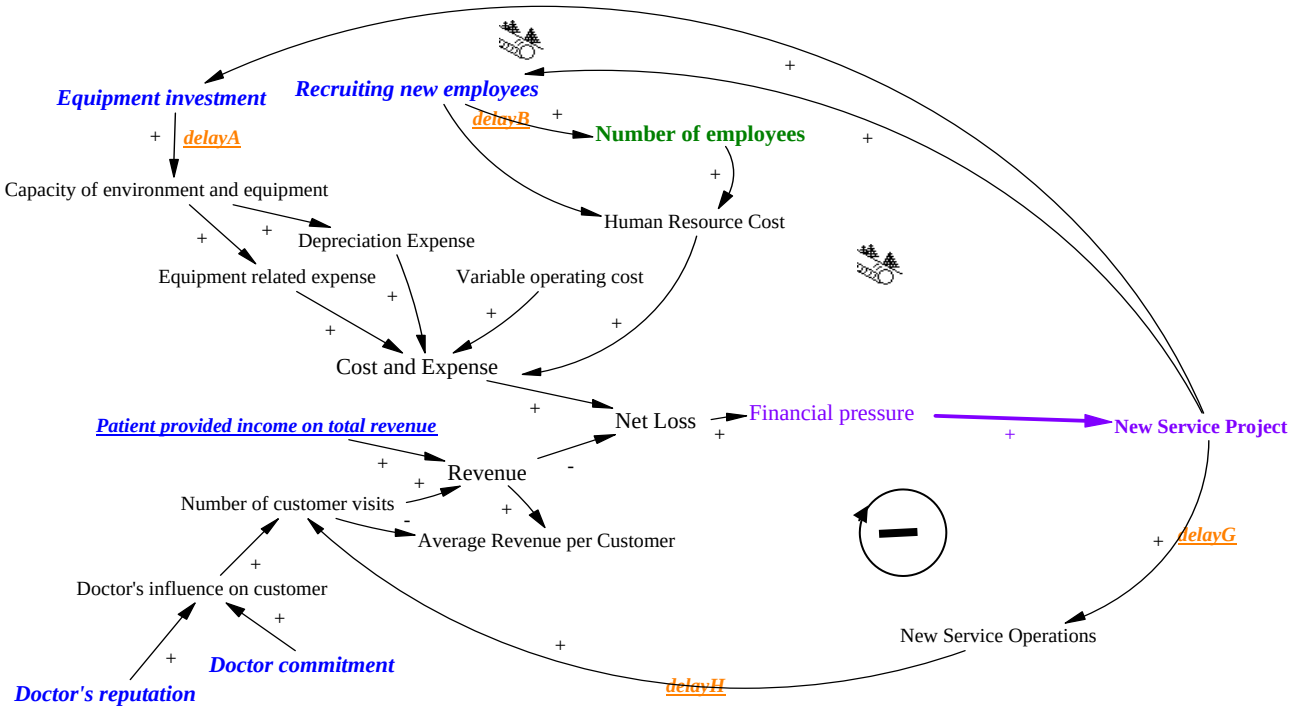


Figure 6: Why wasn't the financial pressure eased?

3. Why numbers of customer were not growing enough?

K Hospital's managers focused on the "expanding and growth strategy". Although they used the BSC as a tool for balancing four perspectives, their mental model of "expanding and growth strategy" dominated and deflected to focus on the financial perspective, the lagging indicators, and the tangible variable. But they neglected the underlying structure, the other perspectives of BSC, the leading indicators, and the intangible variable.

At Figure 7, there were three forces affecting the growing numbers of customer. ***The first feedback loop*** was increasing new services to stimulate new customers flow-in, and it is the expected result of managers. But the other two unexpected effect dominated the situation. ***The second feedback loop*** caused by the financial pressure. The more financial pressure, K Hospital couldn't raise the salary, the more staff perceived that their salary was unfair. After a time delay, the employee satisfaction was going down and not easy to come back. The less employee satisfaction caused service quality eroding gradually or being not satisfied by customers. Therefore, the customer satisfaction didn't achieve the mesmeric feature, the new customers didn't come a lot, and some old customers didn't become loyal customers. The limited numbers of customer growth didn't enrich the financial resource, and the financial pressure still accumulated and drove the situation worse. ***The third feedback loop*** also caused by the financial pressure. The more financial pressure, K Hospital increased new services, which affected on more work lord of all levels and recruited new employees. But the human resource structure had changed, including the work lord was increasing, the salary was still felt not enough, the employee satisfaction was going down, and the number of employee turnover was increasing. The above human resource problem caused the hospital's medical professional skill going down. The professional service quality was not good enough and the customer recognized this hospital was untrustful and not professional. So, the customer flow-in didn't grow largely and the total number of customers didn't maintain very well.

4. Why the professional service quality was not good enough?

What were the factors that affected on the number of customer? What factors affected on customer satisfaction? At Figure 8, we believed that customer satisfaction was affected by service quality and combined professional service quality.

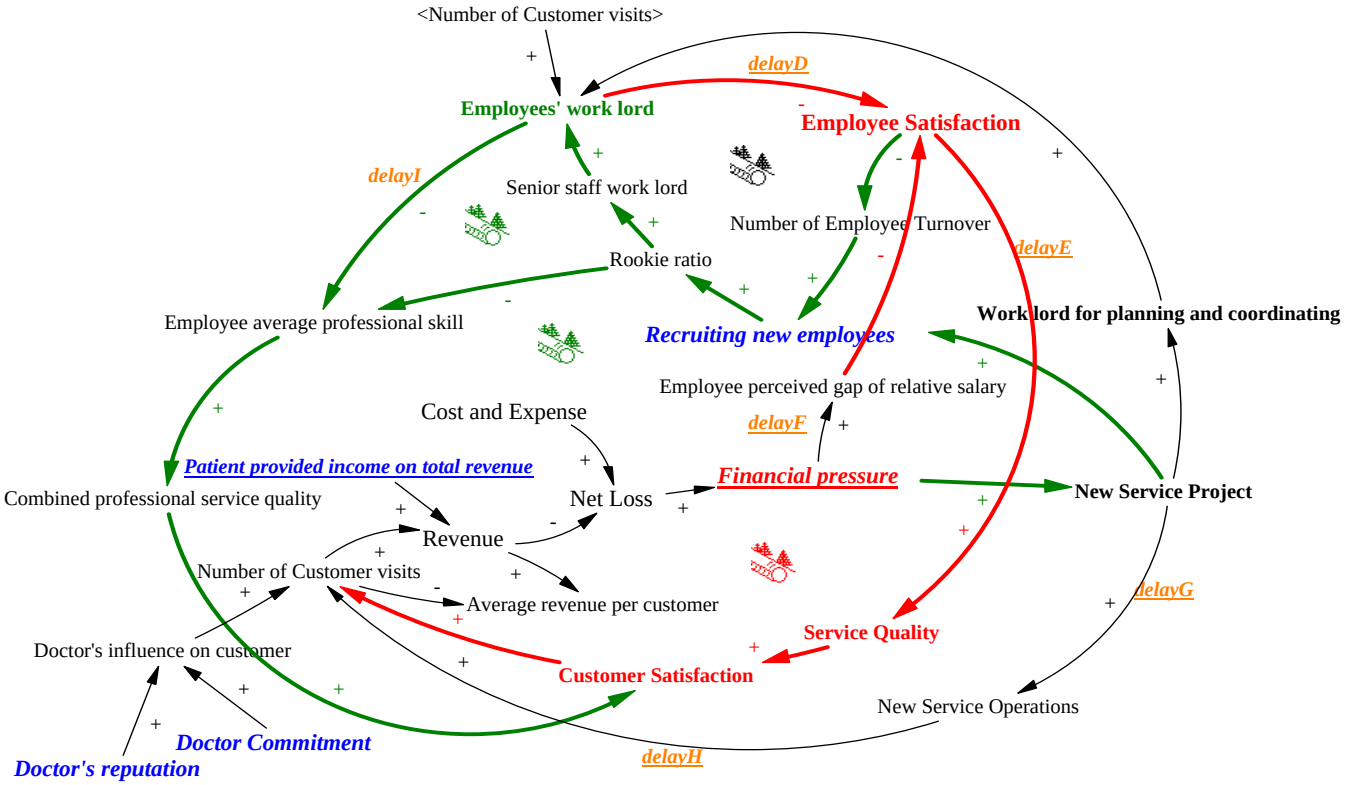


Figure 7: Why numbers of customer were not growing enough?

The combined professional service quality was composed of three factors, including doctor professional quality, employee average professional skill, and environment and equipment capacity.

Combined professional service quality = MIN (doctor professional quality, employee average professional skill, environment and equipment capacity)

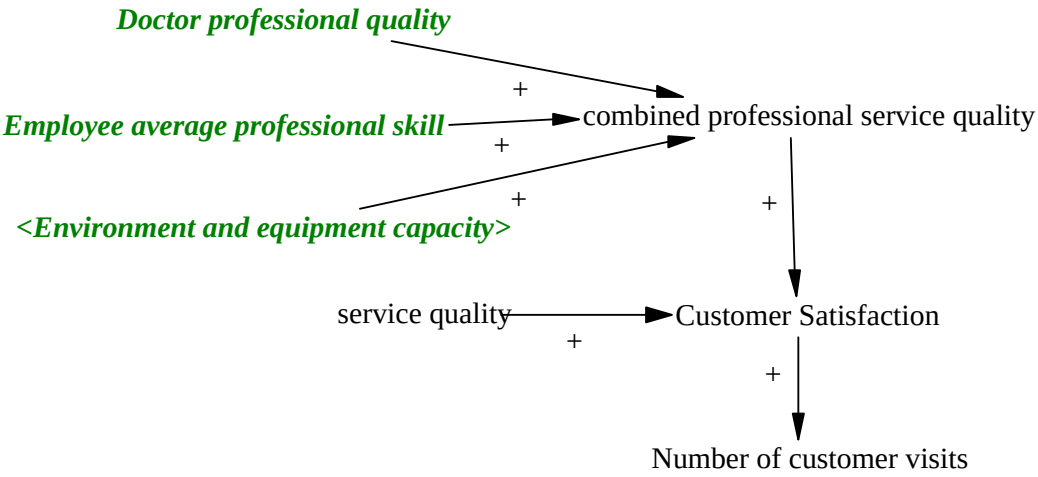


Figure 8: Combined professional service quality

We focused on doctor's influence on customer to explore the combined professional service quality and its components.

As an ideal situation, at Figure 9, doctor's influence on customer was caused by doctor's reputation, customer trust, and doctor's commitment. And doctor professional quality, employee average professional skill, and environment and equipment capacity, were the critical factors.

1. The more customer trust, the more doctor professional quality needed. Therefore, investing in new doctor capacity and participating in some medical research could result in the doctor professional quality improvement.
2. The doctor's commitment was affected by "degree of doctor believing partners' professional" and "degree of doctor satisfied with environment and equipment". And these needed to invest in employee training, recruiting new employees, and invest in environment and equipment.

The above can drive the positive feedback loop to grow by aligning these three capacity investments.

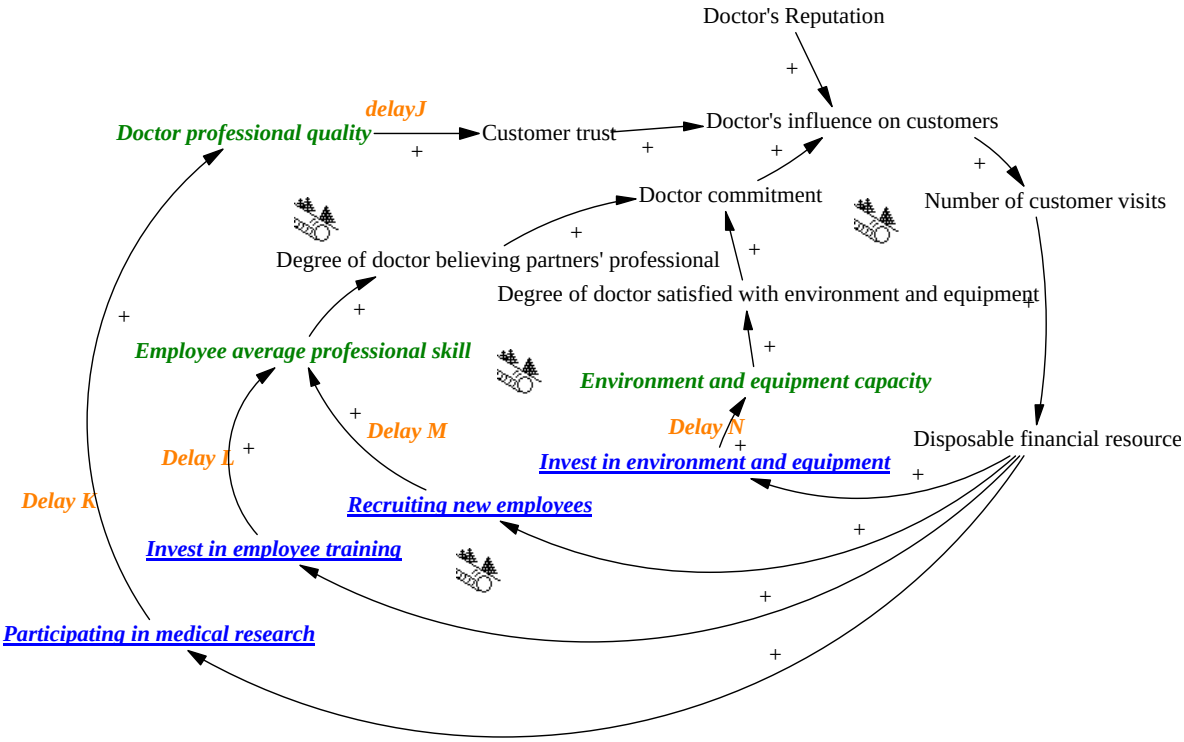


Figure 9: An ideal situation of improving the combined professional service quality

As Figure 9, we proposed the strategy of "BSC with dynamic alignment" to focus on capacity investment and long-term intangible indicators, to be patient with time delay, and to align four perspectives with proper growth pattern.

But the reality is that customers dissatisfied with the combined professional service quality. As Figure 10 we found the dynamic structure, which could explain the reason why the professional service quality wasn't good enough.

Describing the complex system of K Hospital was "highly financial pressure", "limited customer satisfaction", "doctor and professional staff higher work lord", "lower employee satisfaction", "lower employee average professional skill", "lower degree of doctor believing partners' professional", and "lower doctor's influence on customer". Therefore, the expected effect of "expanding new services" was limited, and the BSC strategy was unbalanced. The "over expanding new services strategy" caused by financial pressure interrelated to "difficulty in aligning strategic resources", "difficulty in balancing training cost investment and money saving for loss reduction", "difficulty in balancing external customer and internal customer", and "difficulty in recognizing the deflective mental model which overemphasized the financial perspective".

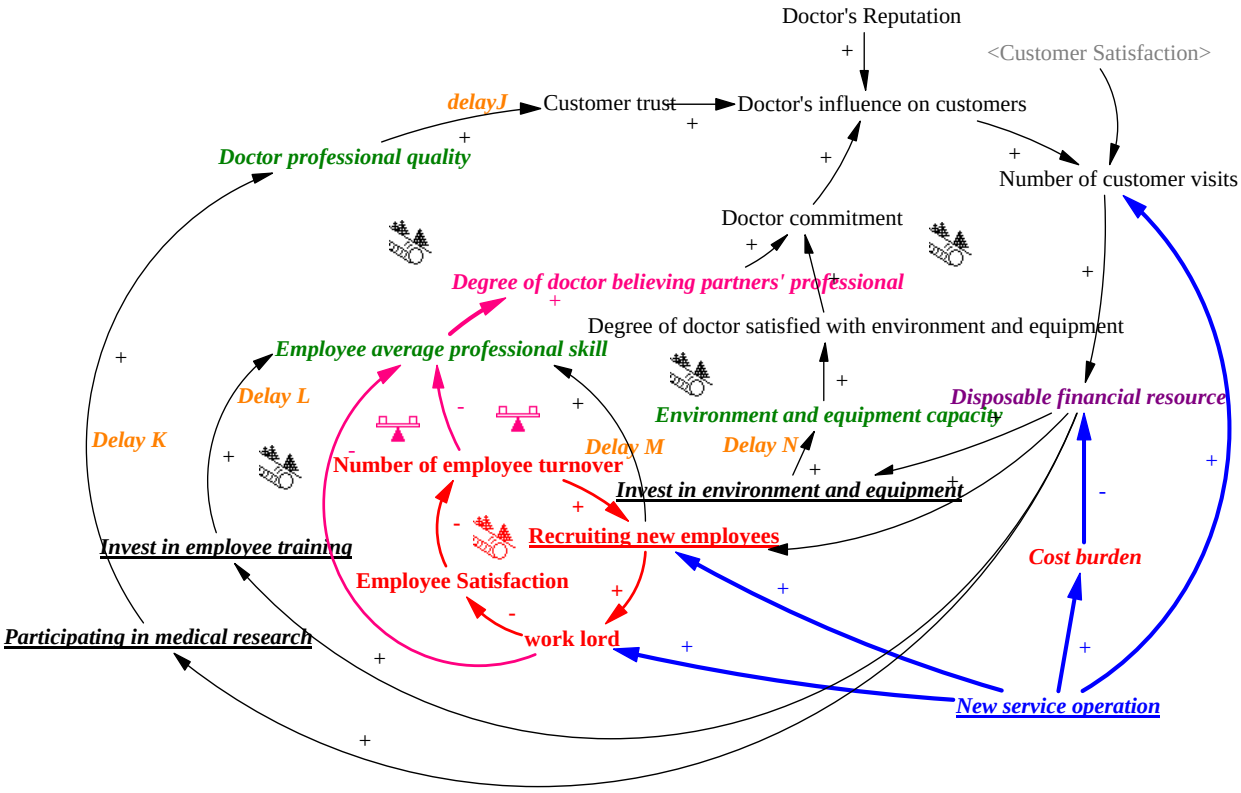


Figure 10: Unbalanced BSC Strategy caused the side effects

Discussion

By combining the experience of K Hospital case study with our previous study (Young and Tu, 2003), we discussed four issues as follows.

Use the dynamic pitfalls to inquire K Hospital's strategy

Firstly, in order to explore K Hospital's BSC strategy deeply, we used the dynamic pitfalls as a set of inquiry items. Through this process, we collected some K Hospital's structural problems (as Table 3), and this process assured us that using the dynamic pitfalls to inquire BSC strategy is constructive.

Exploring the dynamic key success factors -critical dynamic structure

Secondly, we combined of the experience of two case studies, through systems thinking and system dynamics modeling process, and further crystallized five critical dynamic structures (as Table 4). Including *Structure 1: Multiple goal seeking processes with delays drive a growth engine*, *Structure 2: Resource management needs dynamic alignment*, *Structure 3: Fixes one perspective but fail in the systemic performance*, *Structure 4: The underlying learning infrastructure is critical to drive the organizational change*, and *Structure 5: A objective competes with B objective that causes some problem escalation*. These critical dynamic structures and the dynamic pitfalls were essentials of the theory of "Dynamically aligned principles", which could facilitate managers to diagnose problems and generate solutions for BSC development.

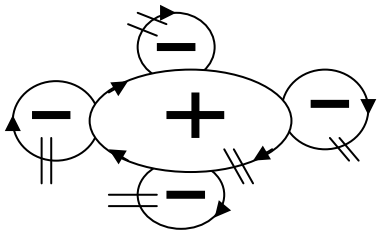
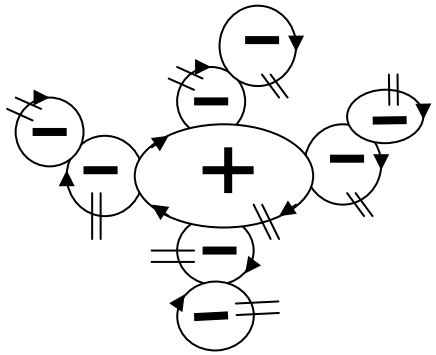
Table 3: Use the dynamic pitfalls to inquire K Hospital's strategy

From previous study (Young and Tu, 2003)	K Hospital (This research)
1. The driving force of growth engine is not strong enough	1. K Hospital too much concern on financial and customer perspective; and neglecting the employee satisfaction, work lord, turnover, and the combined professional quality. 2. K Hospital didn't anticipate managing the limits of capacity, competence, and resource constraints, including the capacity of doctors, professional workforces, environment and equipment capacity, and the competence of "employee average professional skill". So encounter the limits to growth. 3. Some resource accumulations are with time delays, for example the employee satisfaction, doctor's commitment, and customer satisfaction. And without dynamic alignment of resource allocation and accumulation, we could not balance and align the driving forces that interconnected with one another.
2. The difficulties of dynamic strategic alignment	Such a complex system needed diverse investments in strategic plans and actions. Therefore, the resource management became more difficult to keep aligned in space and time. The dynamic complexity misled manager's mental model to deflect to pursue growth for improving financial situation gradually. And then. The decision choice was more and more limited.
3. Conflicts among strategic objectives	The conflicts among strategic objectives caused from two or more goal-seeking feedback loops that had trade-off. Therefore, K Hospital's "growth and improving finance" objective conflicted with "system objective: capacity constraints, employee satisfaction, and doctor's commitment". So the latter force was fighting.
4. Growth and underinvestment in capacity causes limits	The word "capacity" is a level variable, including the capital capacity, the human competence, the service capacity, average skill capacity, and workforces to share the work lording. The above all need sustaining investments in accumulating the capacity stock. Therefore, we must align our strategic actions in managing diverse "critical flows" that could generate the "rate-in" effect to increase the level variables, and decrease the "rate-out" to avoid the depletion of capacity. K Hospital's critical capacities, for example the doctor professional quality, employee average professional skill, and environment and equipment capacity, were combined into the unsatisfactory professional quality, and these were caused by underinvestment in recruiting doctors and professional workforces and in environment and equipment. The other underinvestment in capacity was employee satisfaction, doctor's commitment, and customer satisfaction.

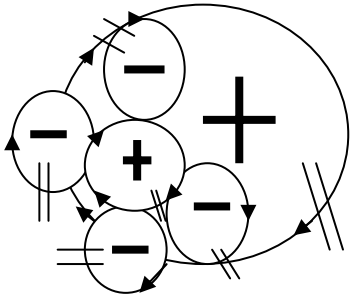
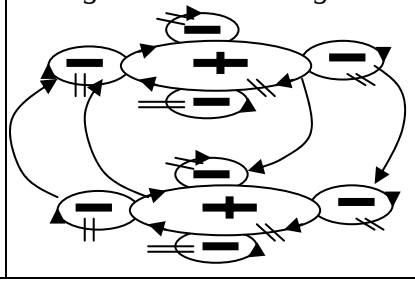
Continued Table 3: Use the dynamic pitfalls to inquire K Hospital's strategy

From previous study (Young and Tu, 2003)	K Hospital (This research)
5. Self-reinforcing feedback loops with time delays increasing the difficulties of resource management	As the cause-and-effect links of the self-reinforcing feedback loops are with time delays, managers may misperceive the information feedback and become not enough patient and visionary for long term resource planning. As Figure 10, expanding new services, K Hospital got more short-term customers and revenue, but neglected the problem of fundamental capacity being insufficient, which caused the long-term constraints. And one constraint would limit the driving force of growth.
6. BSC's strategic objectives formulating the balancing feedback loops with time delays cause oscillation and difficulties in capacity alignment	Balancing multiple capacity investment (balancing loops) with different delay. That's challenging. The difference between Figure 9 and Figure 10 is the patience of waiting for capacity accumulation and the dynamic alignment of different capacity. K Hospital chose to expand the new services largely and broke the structure of Figure 9,which pushed the whole system to become more strained. And the difficulty in being patient and aligning capacity investment became messy.
7. Ignoring the reinforcing feedback loops of leading organizational change smoothly	Using BSC to drive the organizational change is a long-term process. And there are some requirements to get members' acceptance of BSC and organizational change smoothly. K Hospital's BSC needed to review and increase the investment in time and budget for strategy conversation, inviting lower level and employees involvement and commitment, sustaining information feedback for monitoring the performance and preparing for adjustment actions, needs of seeing some improvement of indicators, properly designing a reward system for performance evaluation et al. The interconnectedness of the above factors is composed of some self-reinforcing feedback loops with delays. And once lacking one of the requirements or overlooking the time delays, the feedback loops won't sustain to drive the organizational change. And the implementation of the BSC would fail.

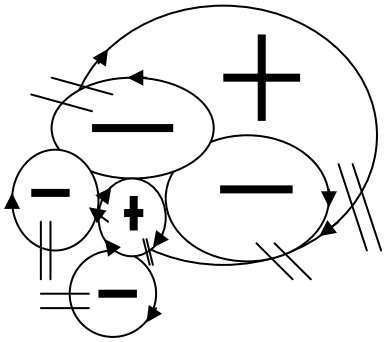
Table 4: Exploring the dynamic key success factors-critical dynamic structure

The dynamic key success factors of previous study can be encompassed (Young and Tu, 2003)	Exploring the critical dynamic structure (from two case studies)	
	Structure	Management Principle
1. Driving the growth engine needs multiple resources allocation and alignment. 2. Considering the dynamic impacts of time delays	*1. Multiple goal seeking processes with delays drive a growth engine.* 	1. Description: A BSC set diverse objectives to achieve one aligned strategy. These objectives should balance multiple goal-seeking processes (balancing loops) with different delay, and they should collectively create a growth engine (reinforcing loop) to enhance the systemic performance. 2. Management Principle: Driving the growth engine is not only to improve financial performance but also to enhance the systemic performance. The most challenging thing is balancing different goal achievement and being patient with the effect of actions. And this structure should preconsider the next two structures (2 and 3).
1. Resource management needs dynamic alignment: antedate to invest in capacity and competence 2. Considering the dynamic impacts of time delays	*2. Resource management needs dynamic alignment.* 	1. Description: In structure 1, the BSC's growth engine doesn't always drive and operate smoothly. As the growth being limited, the reason may be the limited factors begin to result in some goals underachieved. That's because the capacity and competence was underinvested aforetime, which counteracted the goal seeking processes and limited the driving force. 2. Management Principle: The "underinvestment" always needs the resource allocation for capacity investment proactively. So managers should antedate to invest in capacity and competence, and be patient. The most difficult thing is aligned diverse indicators' fundamental investments and makes decisions of resource allocation in proper time and space. And when sinking in limited growth, never push the system to grow before you find the "underinvestment capacity" and decide to enhance it, or the balance of BSC will be broken. And then the system will shift to the Structure 3 and 5.

Continued (1) Table 4: Exploring the dynamic key success factors-critical dynamic structure

The dynamic key success factors of previous study can be encompassed (Young and Tu, 2003)	Exploring the critical dynamic structure (from two case studies)	
	Structure	Management principle
Considering the dynamic impacts of time delays	*3. Fixes one perspective but fail in the systemic performance.* 	1. Description: One of the BSC's perspective got problems and managers adopted unbalanced policy and focused on improving the problematic indicators. The short-term performance of the problematic indicators may improve temporarily, but in long-term period, the underlying structure of getting the systemic performance worse is driving. 2. Management Principle: Following Structure 1 and 2, the BSC was intended to align multiple objectives, but not always operate smoothly. Therefore, the Structure 2's preinvestment of capacity is the fundamental solution. On the other hand, once one of the objectives unachieved, managers must aware that the immediate and reactive action may backfire on the systemic performance in long-term period. And managers should inquire and redesign the BSC strategy in more systemic view.
1. Building the reinforcing feedback loops of creating organizational change smoothly. 2. Using SD to support testing and communicating strategy and to facilitate organizations to experience double loop learning from BSC process.	*4. The underlying learning infrastructure is critical to drive the organizational change.* 	1. Description: The underlying learning infrastructure is based on the interrelationships among the following factors, including the top management's support and awareness, the capacity of communication and dialogue, the middle and low level involvement and recognition, the motivation drivers, and the capacity investment of the above factors. As we consider the BSC methods as a learning or organizational change process, the above intangible structure interacted with the BSC objectives system and made the system more complex. 2. Management Principle: Perceiving the importance of the above factors and allocating resources to accumulate the capacity and competence that affected the intangible structure. Considering the BSC development process as a learning process, which could lead managers to experience the double loop learning. And using system dynamics as a carrier to explore the dynamic complexity, managers could visualize, share, and challenge their mental models collectively, in order to design and communicate a dynamically aligned BSC.

Continued (2) Table 4: Exploring the dynamic key success factors-critical dynamic structure

Exploring the critical dynamic structure (from this case study)	
Structure	Management principle
5. A objective competes with B objective that causes some problem escalation. 	1. Description: BSC's A perspective indicator got problem (financial pressure) and managers took actions (expanding new services), and at the same time B perspective indicator also got problem (high work lord and low employee satisfaction) and managers took actions (recruiting new employees, increasing training cost) too. These two goal-seeking processes would create the escalating pattern (high human resource cost, financial pressure, new services, and work lord; low employee satisfaction). 2. Management Principle: To find a win-win strategy and achieve both objectives (slowing down the expansion of new services and improving the profitability). To inquire manager's mental model that if it was deflected to pursue growth for improving financial situation gradually. This deflection might compete with another objective and limit the systemic decision choice gradually. Therefore, to aware the mental model and learn to explore its systemic consequences.

Redesigning K Hospital's BSC Strategy

Thirdly, through the process of inquiring K Hospital's BSC by systems thinking and system dynamics methods, and the theory of dynamically aligned principles, we redesigned K Hospital's BSC, including the strategic theme and the BSC objectives and measures (as Table 5). And we are trying to feedback our exploration and findings to K Hospital managers till now.

1. <u>Strategic Theme (after inquiring with system dynamics)</u>

Clarifying K Hospital's focus and starting point: focus on all medical services or from some specialized services to other services.

Investigating customer needs to facilitate hospital to reposition strategy posture.

Slowing down the expansion of new operating activity and reviewing the old operating activity.

Enhancing the combined professional service quality: investing in new doctor capacity and participating in some medical research; investing in employee training, recruiting new employees; and investing in environment and equipment.

Enhancing the employee satisfaction: combining "slowing down the expansion of new operating activity" with "investing in employee training and recruiting new employees" to decrease the work lord gradually; at appropriate timing, K Hospital should utilize the methods of "raise salary properly" and "promote some excellent staffs".

Enhancing operational excellence and cost management: be patient with the above strategic benefit; at the same time, managing cost and reducing inefficient activity, and enhancing "revenue per employee" and "revenue per patient"; and utilizing the cost-benefit analysis to get the information feedback about customer needs.

2. K Hospital's New Balanced Scorecard (after inquiring with system dynamics)

Table 5: K Hospital's New Balanced Scorecard

	Objective	Measure
Financial Perspective	*Enhancing operational excellence and cost management*	1. Revenue 2. Patient-provided income 3. Revenue per employee 4. Revenue per patient 5. Cost ratio (HR cost, operating cost)
Customer Perspective	*Investigating customer needs*	1. Number of services recognized and eulogized by customer 2. Customer satisfaction (outpatient, inpatient, emergency room patient) 3. Customer complaints 4. Average patient visits per week 5. New customers
Internal Process Perspective	*Enhancing the combined professional service quality*	1. Percentage of employee being able to handle direct patient care problem 2. Emergency room transfer rate 3. Doctor professional quality 4. Employee average professional skill
Learning and Growth Perspective	*1. Enhancing the employee satisfaction* *2. Slowing down the expansion of new operating activity*	1. Employee satisfaction 2. Employee turnover 3. Doctor's commitment 4. Number of doctor 5. Number of employee 6. Human resource cost (training, salary) 7. Work lord 8. Number of new services 9. Environment and equipment investment ($) 10. Trends in number of customers and margins of each service

Compared "Unbalanced BSC Strategy" with "BSC with dynamic alignment"

At the last issue, we compared the K Hospital's original "*unbalanced BSC strategy"* with the "BSC *with dynamically aligned strategy"*. The comparison was categorized into strategic focus, example, strategic theme, dynamic structure, difficulty, and indicators (as Table 6).

Through this process, we found a possible explanation for Lipe and Satlterio (2000) studying on the "judgmental effects of managers processing BSC indicators". They used experiment method to examine judgmental effects of the BSC and found that performance evaluators who focus on common measures (financial indicators) may largely disregard leading measures. Kaplan and Norton (1996ab) noted that underweighting nonfinancial and leading measures undermines the goals of the BSC, which was expressly designed to incorporate such measures into managerial thought and decision-making.

In this research, we believed that "the judgmental effects of managers processing BSC indicators", which is not only because the limits of human processing information, but also because managers are the prisoners of the system. Managers' mental model interacted with the whole system. And the interaction was a dynamic interdependent process. Manager's small deflection to financial indicators might cause systemic dilemma unexpectedly. And the system structure might also drive manager's information judgment. To sum up, since the BSC system was in dynamic complexity, managers' original mental model was dominated by an interdependent system. So, a BSC strategy without dynamic alignment means failure.

Table 6: Compared "*unbalanced BSC"* with "BSC *with dynamic alignment"*

		Unbalanced BSC Strategy	BSC with dynamic alignment
Focus		Deflect to focus on the financial performance.	Focus on capacity investment and long-term intangible indicators, be patient with time delay, and align four perspectives with proper growth
Example		As Figure 10, financial pressure drove new services projects, but the over expansion caused the whole system going down. The increasing cost burden, the increasing work lord, staff increasing perception of being unsatisfied with salary and development, and number of customer increasing but contributing limited margins. The long-term indicators were declining and neglected.	As Figure 9, before expanding new services, this strategy focused on capacity investment. The dynamic alignment of doctor professional quality, employee average professional skill, and environment and equipment capacity, should be noticed. The time delay from multiple investment actions to cause the capacity accumulation should be aligned with patience. And the mental model of pursuing growth should be reconsidered.
Theme	Financial	*Balance revenue and cost to break-even, and create profit*	*Enhancing operational excellence and cost management*
	Customer	*Create new value for customer*	*Investigating customer needs*
	Internal process	*Ensure service quality and expand service networks*	*Enhancing the combined professional service quality*
	Growth and learning	*Make employees become leaders*	*1. Enhancing the employee satisfaction* *2. Slowing down the expansion of new operating activity*
The dynamic structure		● Systems Archetype: 1. Fixes that fail 2. Growth and underinvestment ● Balancing multiple capacity investment (balancing loops) with different delay	● Balancing multiple capacity investment (balancing loops) with different delay
Difficulty		● Manager's mental model deflected to pursue growth for improving financial situation gradually. ● Decision choice was limited.	● Manager's mental model deflected to pursue growth for improving financial situation gradually. ● Decision choice was limited.
Indicators		1. Overemphasize: the financial indicators 2. Neglect: the employee satisfaction, and some leading indicators. 3. Systemic inability to control: employee work lord, revenue per employee, equipment utilization rate, combined professional service quality.	Leading indicator: Doctor professional quality, Employee average professional skill, Employee satisfaction, Employee turnover, Doctor's commitment, Work lord, and Customer satisfaction.

Conclusion

The Balanced Scorecard (BSC) makes both practitioner and academic take notice these years. The reason is that BSC rethinks performance measurement system of organizations. And furthermore, BSC has become a strategic management system that can facilitate organizations to identify the operational factors which driving future success, to align their strategic objectives and actions, and to accumulate the resources that can create long term competitive advantage.But some literatures showed that the BSC theory and practice had some limitations, and the authors concerned that cause and effect are not closely related in time and space, which cause the BSC development generating the dynamic complexity. And they proposed the theory of using system dynamics as a method to overcome the limitations to current BSC theory and practice.

This research, following system dynamicists' searching for generic structures, is focused on generating the "dynamically aligned principles" level for the theory of developing BSC with system dynamics. And by exploring some dynamically aligned principles we could facilitate managers to diagnose problems and to generate solutions for BSC development. By a case study, we build the qualitative and quantitative system dynamics model and inquire its BSC strategy. We present the case study with causal loop diagram. Then, we follow our previous research result and look over the theory of "dynamic pitfalls, key success factor and structure". And we generalize some dynamically aligned principles.

Through the process of generating the theory of dynamically aligned principles, for developing BSC with system dynamics, we proposed four critical issues. Firstly, in order to explore BSC strategy deeply, we used the dynamic pitfalls as a set of inquiry items to collect systemic problems. And we believe that the process of using the dynamic pitfalls to inquire a BSC and to remind managers abidingly is constructive. Secondly, we further crystallized five critical dynamic structures, and each structure had its structure, description, and management principle. These structures are *Structure 1: Multiple goal seeking processes with delays drive a growth engine, Structure 2: Resource management needs dynamic alignment, Structure 3: Fixes one perspective but fail in the systemic performance, Structure 4: The underlying learning infrastructure is critical to drive the organizational change*, and *Structure 5: A objective competes with B objective that*

causes some problem escalation. These critical dynamic structures and the dynamic pitfalls are essentials of the theory of "Dynamically Aligned Principles", which could facilitate managers to diagnose problems and generate solutions for BSC development. Thirdly, by systems thinking and system dynamics methods, and the theory of dynamically aligned principles, we redesigned K Hospital's BSC. And we are communicating our exploration and findings with K Hospital managers till now. Lastly, we compared the K Hospital's original *"unbalanced BSC strategy"* with the "BSC *with dynamically aligned strategy"*. And we believe that "the judgmental effects of managers processing BSC indicators", which is not only because the limits of human processing information, but also because managers are the prisoners of the system. Manager's small deflection to financial indicators might cause systemic dilemma unexpectedly. And the system structure might also drive manager's information judgment. To sum up, since the BSC system was in dynamic complexity, managers' original mental model was dominated by an interdependent system. So, a BSC strategy without dynamic alignment means failure.

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Back to the Top