Evolution of a System Dynamics Intervention:

How changing the rules in a small health care private practice can redefine the strategic position of the firm and increase overall performance.

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Abstract

This paper reports an ongoing project using system dynamics modeling as the unifying framework for understanding how to change and improve the way a small health care practice is managed. Through the development of the project we have used group model building sessions, one-to-one exploration of structural explanations, and extensive model building and testing to clarify hypotheses related to different areas of the practice considered key by our clients. Major insights found include: strategic management of accounts receivable, a switch in strategic orientation of the practice and its implications, and the realization of backlog of patients as a key driver of the firm' dynamics. Based on our experience, a general framework for system dynamics interventions is presented. Additionally, three system dynamics models developed for the study are presented and explained.

Keywords: Health-Care Dynamics, System Dynamics, Innovation, Implementation, Best Practices, Rules, Rule Making, Rule Dynamics

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Introduction

This paper presents a case study of a system dynamics intervention undertaken by a small private-practice health care provider in upstate New York specializing in oral-maxilofacial surgery. The purpose of this intervention was to improve the financial performance of the practice and to understand how best to elicit and provide system dynamics insights into a small for-profit organization.

The practice was established at one location in 1994 and expanded to a second location in 1999. The practice had financial growth of 1250% from 1994 to 2001 and grew from 4 to 26 employees in the same period of time. By December of 2002, the practice offered this array of services: oral surgery implants, oral pathology, and facial cosmetics in their office practice, and they provided hospital-based facial trauma, tumors, and reconstructive surgery. In late 2001, the practice began to experience reduced earnings. Moreover, concerns about quality control and staff turnover began to increase. The managing partner was concerned about this and hoped to head off problems before they became acute. To accomplish this, the managing partner began identifying "best practices" inside and outside of the industry (six sigma quality control, lean manufacturing principles, etc). These best practices were implemented to improve and standardize both quality and operational capabilities. These innovations proved efficient and effective (for examples of innovation implementation in different industries see Cobbenhagen, 2000), yet the managing partner felt that the hoped for results were never realized.

The managing partner's search for improved ways of managing growth lead him to system dynamics modeling and systems thinking tools. The concept of feedback processes generating behavior (Forrester, 1975; Richardson, 1991; Sterman, 2000) resonated well with the managing partner. Furthermore, the managing partner's philosophy has always been that he needed to be capable of understanding and implementing the management tools necessary for operating a successful practice. In addition, he felt that his staff had to participate in the learning process in order to understand and accept the changes he was asking them to make.

In order to bring himself up to speed, the managing partner took formal classes in system dynamics modeling and brought in consultants to assist with group model building (to bring the staff along), to assist with the development of formal and informal system dynamics models, and to act as a system dynamics coach so that the managing partner could begin to develop his own models of important organizational issues. The intervention encompassed multiple phases that involved group model building, coaching, and the development of formal models.

The Phases of the Intervention Process

The intervention process was, after the fact, divided into four distinct phases that served different purposes, activities, time frames, and resulted in various outcomes. The involvement of the managing partner of the practice has been key in the development of the project. The managing partner has acted as client, group participant, gatekeeper for the group model building process (Andersen and Richardson, 1997; Andersen, Richardson and Vennix, 1997), project champion and a member of the modeling team. The project phases are:

- First Phase—Initiation
    - Purpose: Becoming acquainted with system dynamics (managing partner and staff).
    - Main Activity Developed: Taking formal courses in systems thinking and system dynamics to enhance modeling skills (managing partner).
    - People Involved: Managing partner and staff.
    - Time Frame: 12 months.
    - Main Outcome: Identifying the powerful role system dynamics can have in managing the firm.

- Second Phase—Organizational Learning
    - Purpose: Introducing system dynamics to the firm.
    - Main Activity Developed: Group sessions to explain system dynamics; group sessions for developing concept models; individual sessions expanding on insights generated by modeling; and identifying leverage points in the system
    - People Involved: All employees.

  - Time Frame: This phase lasted 12 months; however, the actual time staff was involved varied. Group sessions were scheduled for every other month. In addition, during weekly group sessions some aspects of the system dynamics based interventions were explored and explained in detail.
  - Main Outcome: All employees were introduced to system dynamics terminology and icons and the purposes for using system dynamics models. Health-Care 1, a system dynamics model, was developed (reported on Martínez-Moyano and Wadhwa, 2002).

- Third Phase—Diffusion
  - Purpose: Use of system dynamics to guide strategic decisions.
  - Main Activity Developed: Introduction of system dynamics models developed from weekly staff meetings.
  - People Involved: All staff members, modelers, and the occasional facilitator.
  - Time Frame: Six to nine months.
  - Main Outcome: Organizational recognition of the 'new' way of identifying 'what is happening and why'. New and improved understanding of how my work influences performance of the firm (why my work is relevant).

- Fourth Phase—Consolidation
  - Purpose: Introduce system dynamics as part of the standard operating decisions for management practice in the firm.
  - Main Activity Planned: Change in standard formal procedures to include system dynamics based elements, more formal training in system dynamics for the staff members, and establishment of strategic alliance with modeling experts to supervise the in-house work.
  - People Involved: Managing partner, modeling coaches, and facilitators.
  - Time Frame (planned): Six to twelve months.
  - Main Outcome (expected): Deeper understanding of how to include dynamic considerations in management, change in culture in the organization to adopt a new 'norm' that includes dynamic thinking and holistic approaches to management problems, and linking the new way of looking at the firm's problems and opportunities with the day-to-day decision making processes.

The timeline for the intervention is shown in Figure 1—above. We present the general timeline of activities to show how the different phases evolve over time.

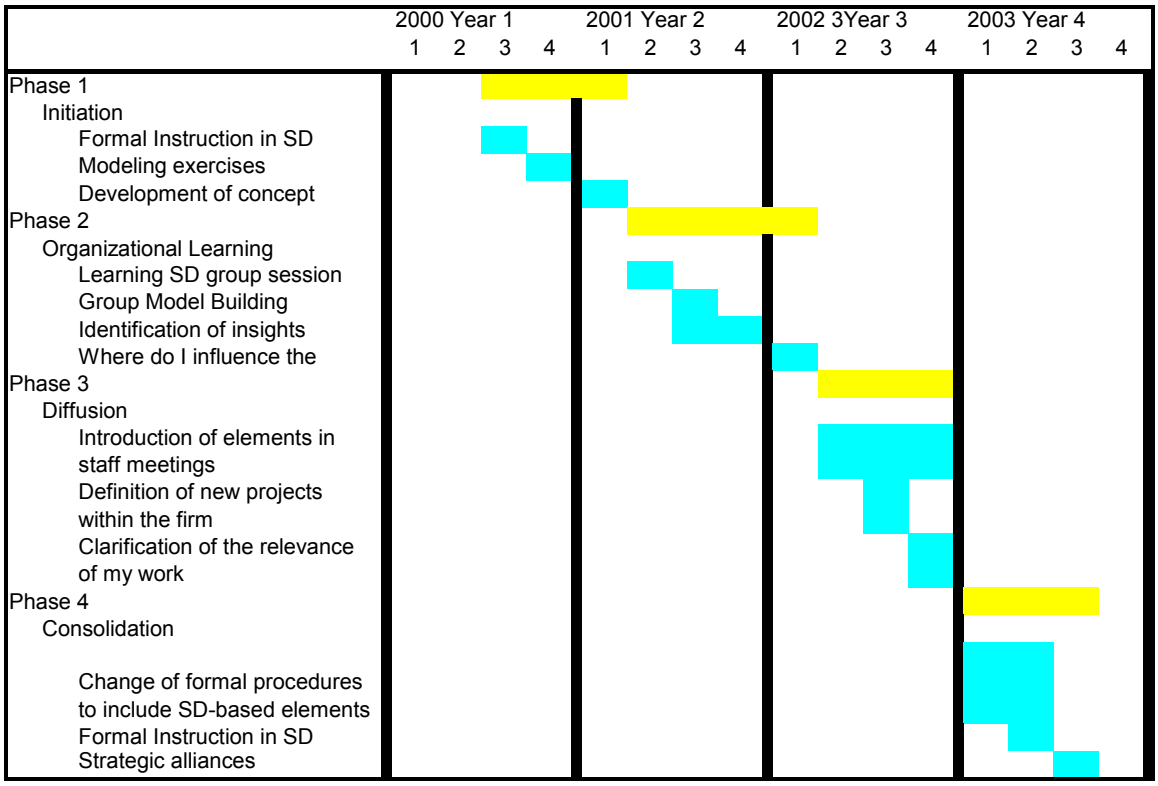

Figure 1—Timeline

Process and Products

First Phase—Initiation—Getting acquainted with system dynamics

The first phase was structured with the goal of having the client group participate in the development of the formal model in order to foster model ownership. To achieve this goal while simultaneously working on research through 'real action' in the organization (for action research elements see Argyris, Putnam and Smith, 1985; Argyris and Schön, 1996) one-hour weekly meetings, with the practice's management team, were undertaken. These meeting lasted two months and the group decided that the products the modeling effort would attempt to generate were:

1. Structural understanding of the elements that causes the behavior observed of the Health-Care Practice.
2. Dynamic understanding of the practice.
3. A policy testing instrument to enhance the practice's strategic planning capabilities.
4. A means to increment the development of the firm's organizational intelligence.

The Concept Model Used

During the initial part of the intervention (following Andersen and Richardson, 1997; and Andersen, Richardson and Vennix, 1997) a concept model was used. The concept model used (see Figure 2, below) was designed to capture the staff's attention to the dynamic process of the firm and to convey the stock and flow terminology.

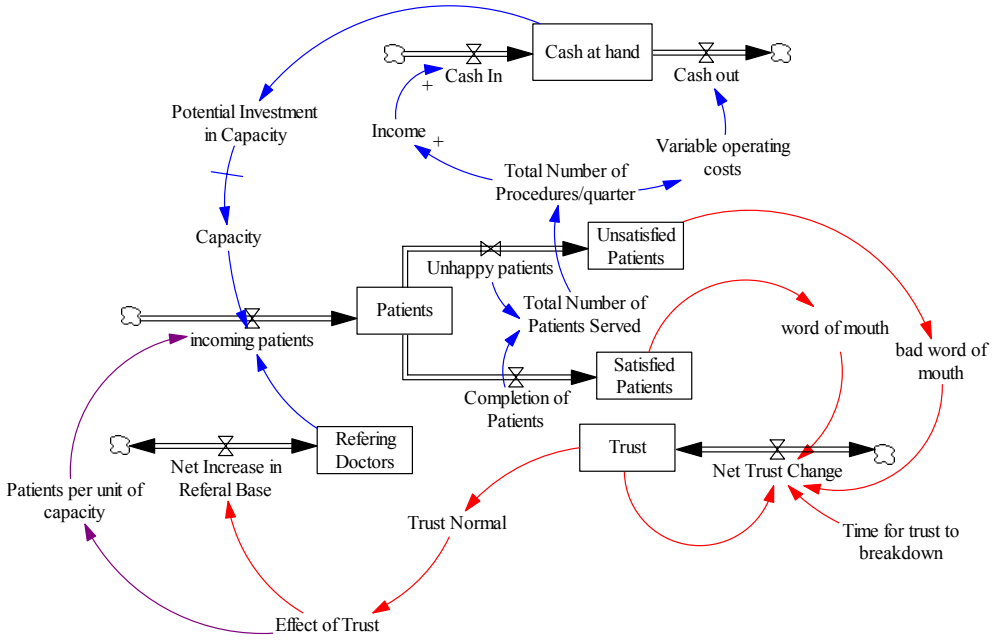

Figure 2—Concept Model

Second Phase—Organizational Learning

Introducing System Dynamics to the Firm

The Key Reference Modes

To understand the system through a group model building approach, one key element is to elicit the variables and reference modes of importance, to the group (Andersen and Richardson, 1997), in an

effort to capture their view of the system. The group identified the following four variables as being the most relevant for this study. Those four variables are: (1) employee workload, (2) employee productivity, (3) perceived quality, and (4) net earnings. The group created reference modes for these variables expressing desires and fears about what would or could occur in the future. Figures 3 to 6 show the reference modes for the variables. The desired behavior is identified with a dashed line and the feared with a solid line.

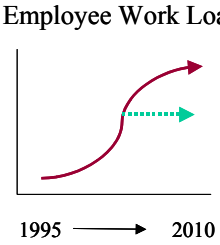

Figure 3—Employee Work Load

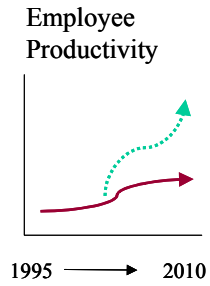

Figure 4—Employee Productivity

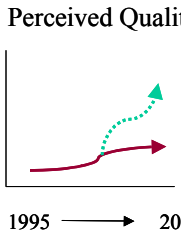

Figure 5—Perceived Quality

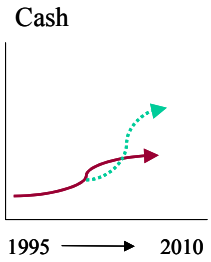

Figure 6—Net Earnings

According to the group, workload had been increasing while productivity had stalled. This influenced the perception of quality and results in stagnant earnings. With these four variables in mind and relying on the concept model as an elicitation device, we worked with the group to create a feedback-centered understanding of the dynamics of the organization. The group identified eight major causal loops; two of them are shown in Figures 7 and 8.

The Causal Loops

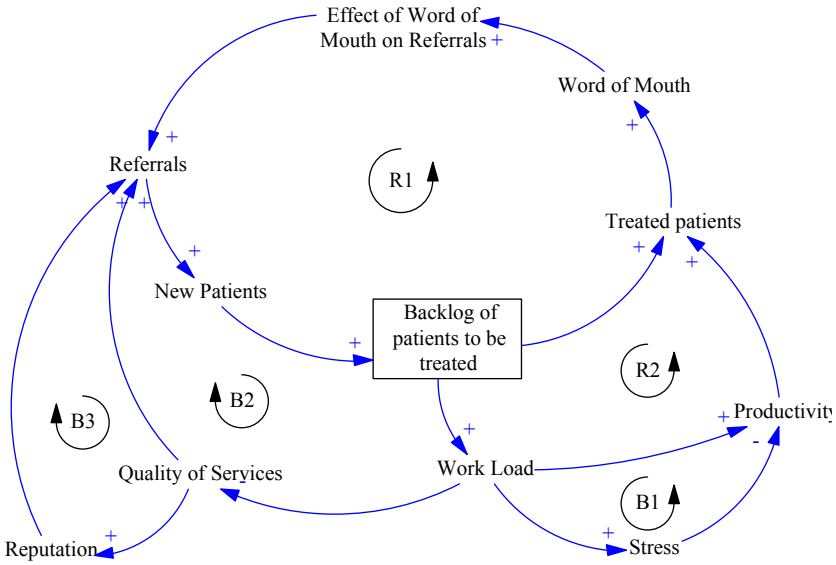

Figure 7—Workload Loop

In the firm, the workload loop, Figure 7, is a central loop for explaining pressures on growth processes and the dynamic behavior observed by participants and shown in Graphs 3 to 6. The group believed that workload influences productivity and the quality of services as well as being a key element of stress generation.

Figure 8 shows the productivity/staff loop that allows us to clarify the effect that staff have on productivity and the way in which the different pressures are generated. As the number of treated patients grows, available income increases, influencing the ability to hire new staff and through an augmented total staff, influence the workload. This is positive in the sense that staff will have enough time to deliver quality services and stress levels could be reduced. However, additional staff requires that experienced staff be allocated time to train the new staff in the specific processes of the firm. General knowledge is obtained by new staff from education and experience in other practices, but specific knowledge related tot he firm must be provided by experienced individuals within the firm (Brickley, Smith and Zimmerman, 2001, pp. 341-342).

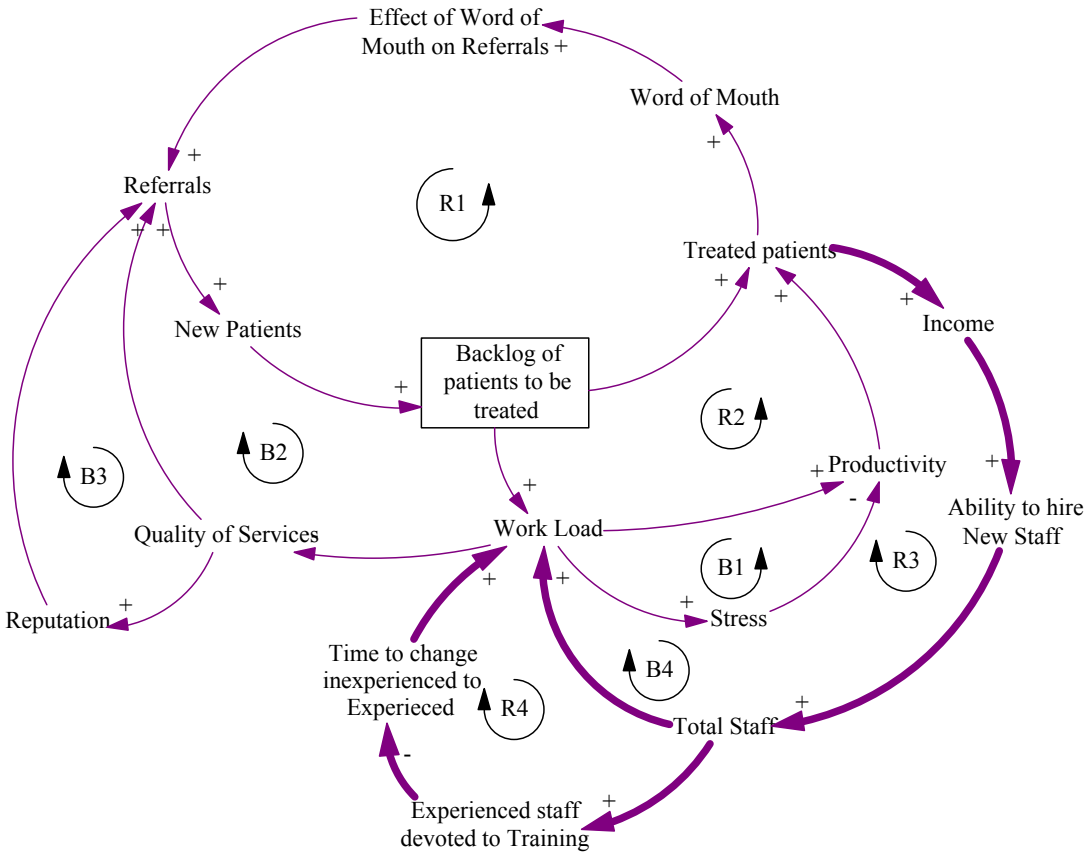

Figure 8—Productivity/Staff Loop

The Health-Care 1 System Dynamics Model

The original model had been conceptualized in five Sectors (Operations, Community, Knowledge-Based Innovation Projects, Human Factor, and Financial). Figure 9 shows the sector diagram.

For the development of understanding of how the practice was managed, identifying the different sectors was key. In the beginning of this intervention process, in our conversations, the financial sector kept on being described as the most important one in the practice. Over time, the conversations went to the other sectors as the realization of the interconnectedness of elements in the firm arose. Members of the firm recognized this insight as very important because it allowed them to 'connect' their individual activities to the bottom line of the practice in a very clear and simple way. The development and use of the sector diagram became one appealing tool to communicate the system's structure to the staff.

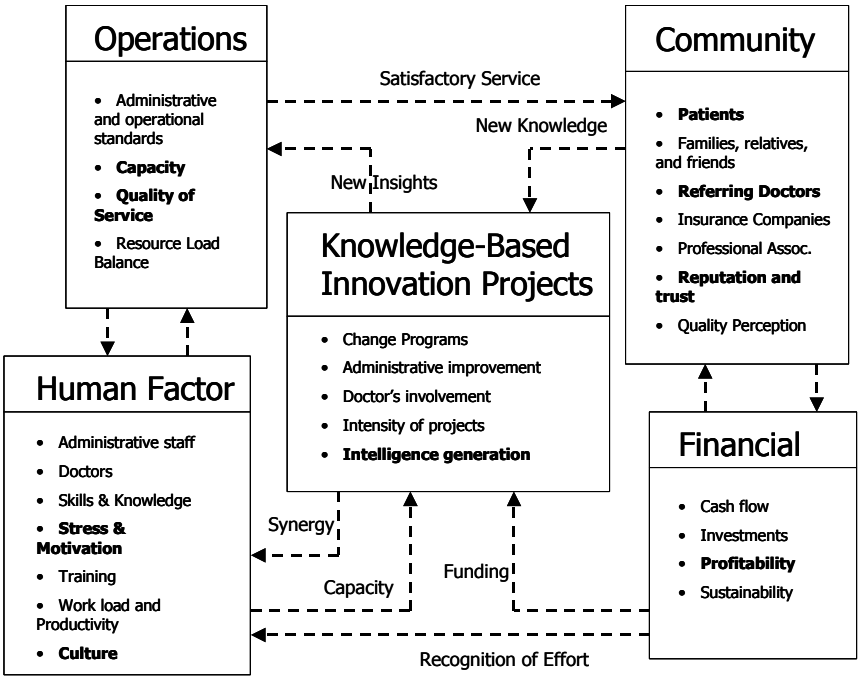

Figure 9—Sector Diagram

The Behavior of the Model

The modeling effort was conducted following standard practice to enhance quality and confidence in model results (for an explanation of the process followed see Richardson and Pugh, 1981; Martinez and Richardson, 2001; and Martínez-Moyano and Richardson, 2002). Figures 10 and 11 show the base-case behavior and the improved-case behavior of the model.

The base run considers a 20% increase in the average tasks per patient. This run is considered the base-case run because due to the implementation of innovations and increased administrative controls the average number of tasks that the firm has to perform had incremented. Innovation and uncertainty go hand in hand; successfully implementing innovations require a different management style and organization than the one used in steady-state processes (Cobbenhagen, 2000, p. 277) . Companies should recognize this and change the way they conduct business during the process—steady-state equilibrium, transient-state dynamics, and new equilibrium of the firm.

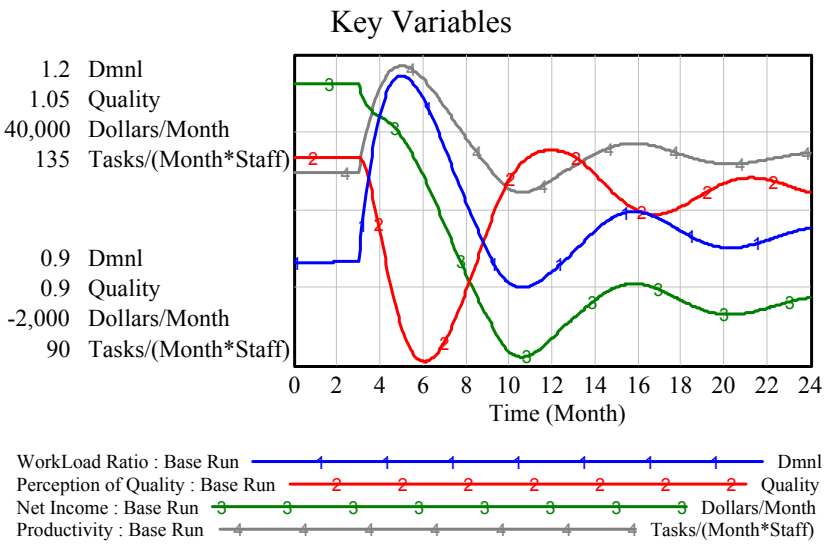

Figure 10—Base-case Run

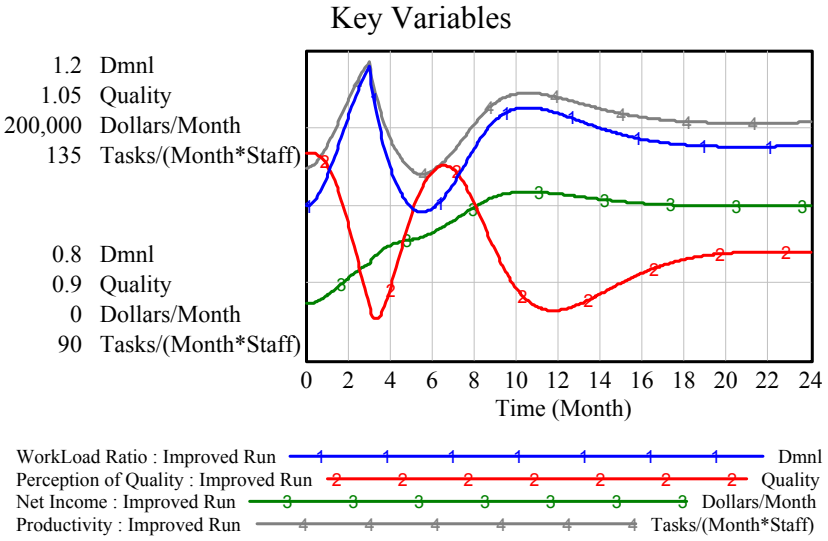

Figure 11—Improved-case Run

In order to identify successful innovations, we need to know what does it mean in the context of the firm. Cobbenhagen (2000, p. 71) offers a definition of successful innovation as being 'the economic exploitation of innovation' and saying that it is difficult to identify a way to understand the *successfulness* of the innovation in firms. Based on the results of the study conducted, we say that successful innovations

are those that can act as levers for the attainment of goals that are dynamically coherent and systemically desirable (Lane and Oliva, 1994) in the context of a culturally-feasible change.

According to Cobbenhagen (2000, p. 273) three elements are necessary to create successful innovations: a strong knowledge base, ability to proactively manage innovations, and ability to manage the relationship with the environment. The improved-case run, shown in Figure 11, uses these concepts to create better behavior of the system. In this run, a 20 percent decrease in the average tasks per patient is simulated along with doubling the average number of contacts per referring doctor from 11 to 22. These changes assume that the innovation is proactively managed (the application of the lean concepts to decrease the number of tasks), that a strong knowledge base is created (to actually induce the changes), and that the relation with the environment is managed adequately (by means of increased contacts with refereeing doctors). This improved run is just a first approximation to a more complete exploration of the complex set of combinations and possibilities present in this case study. It is now clear that innovation management comprises many ingredients from complexity—large number of variables involved, tightly interrelated in non-linear fashion, and highly dynamic—that makes it both an interesting research theme and particularly suited for being studied using system dynamics (Milling, 2002, p. 85).

Third Phase— Diffusion—Extensive use of system dynamics as guiding strategic and innovative framework

The sectors further developed presently in the firm include:

1. Operations Sector
    a. Capacity
2. Financial Sector
    a. Cash Flow/Accounts Receivable

Operations Sector

The diagram presented in Figure 12 captures the primary feedback loops observed in the larger formal model of the operations sector of the practice. The practice had historically considered and still considers quality to be of the utmost importance. Allowing quality to slip in order to see more patients or to reduce waiting time for routine procedures was never considered acceptable.

The practice had performed six-sigma studies that had worked to standardize routines in order to reduce errors, replication of work, and to increase efficiency and productivity. What the model indicated was that the practice should focus on the backlog of patients waiting for routine services. The initial group model-building project resulted in the identification of workload as being at the center of numerous feedback loops. The formal model also identified the workload as being critical, but with limited technological improvements being available to increase productivity. The implementing of six-sigma standards having already occurred in the practice and quality in a healthcare practice being relatively fixed by standard operating procedures, left management as one of the few places in this system that had control over limiting the backlog of patients waiting for services.

For the practice in this case, being proactive and limiting the growth of the backlog of patients by means of refusing to accept new referrals had not occurred before. Traditionally, all referrals and all referring doctors had been accepted (after all, getting more business in is always better according to normal intuitive thinking). Patients with acute problems would be scheduled quickly, but patients without acute problems were given the next available date for treatment. Under these conditions patients who felt that the wait was too long would go elsewhere. Furthermore, referring doctors who felt that their patients were waiting to long for appointments would also begin to refer a larger portion of their patients to other specialists.

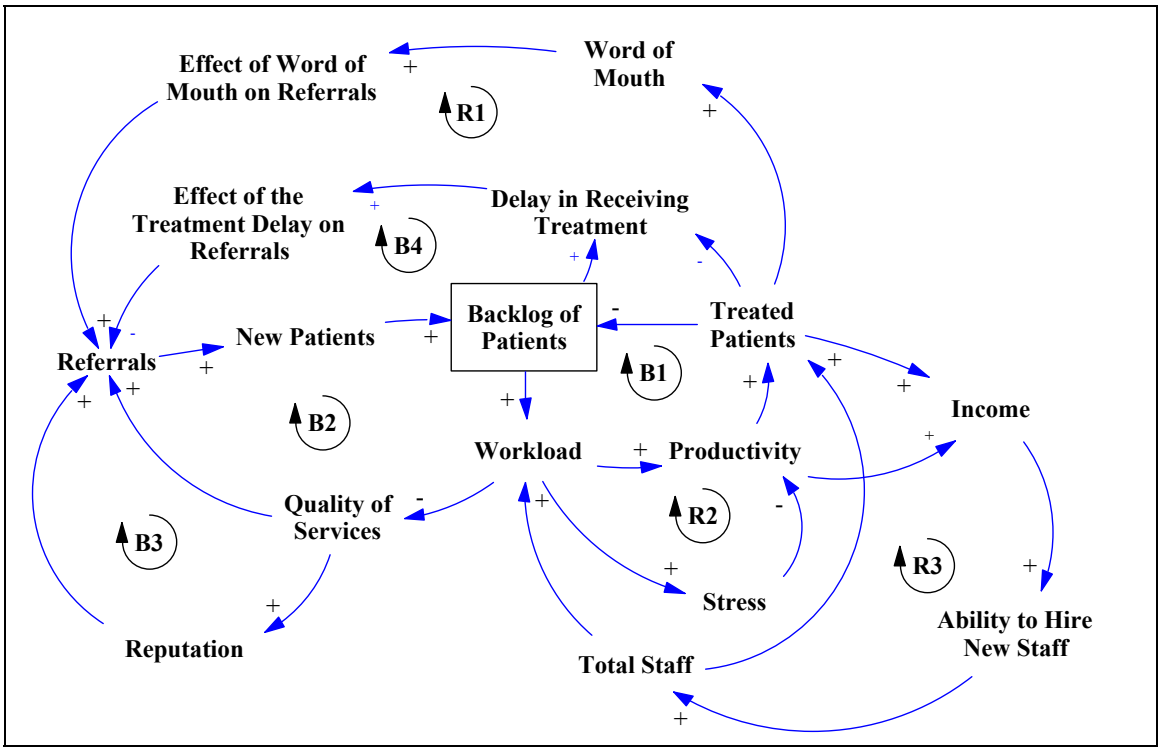

Figure 12—Operations Sector

When the model revealed this behavior the managing partner noted that historically there had been an oscillation in referring doctors and in the waiting time for treatment. This oscillation had always been attributed to the economy, relationships with referring doctors, and changing health care coverage policies. The model indicated that those exogenous forces might not be solely responsible for the oscillation in the number of patients the practice treated. The idea that waiting time for treatment was important to both patients and referring doctors resonated well with the managing partner. Furthermore, the model revealed that a proactive approach, where policies to weed out referring doctors who did not refer a profitable and interesting mix of patients, could be implemented when the backlog got high.

The practice began to keep a database of referring doctors and patients. When the backlog got too large the number of referring doctors was selectively cut. Based on a set of criteria the practice was able to decide whom they would prefer to work with. This resulted in a reduction in staff turnover, the ability to see patients quickly, the ability to spend additional time with patients and thus generate a

perception of quality, and earnings increased as referring doctors dumping less profitable patients on the practice were eliminated. For the managing partner of the healthcare practice, the realization that the practice had more control over what was happening than originally thought was enlightening.

Financial Sector

The structure shown in Figure 13 captures the aging chain for late payments. The practice had resources allocated along the aging chain to capture funds that were owed, but not yet paid. Any errors in coding resulted in the rejection of claims by third party payers (insurance companies). These errors would need to be identified, corrected and the bills resubmitted. The third party payers are under no legal obligation to make payments on bills submitted correctly after 90 days of the treatment rendered. The practice must then petition the insurer or request the patient to pay the bill out of pocket. This results in reduced cash flow, due to waiting for payment, and loss of income as only a portion of the late bills tends to be paid after too much time has elapsed.

The structure in Figure 13 was developed with the senior partner to capture the aging chain for late payments. From this point it was anticipated that this structure would be elaborated and the resources allocated and the decision rules for allocating those resources would be captured. However, from this structure the senior partner realized that the policies they had been using of rewarding employees working on late payment accounts based on the amount of collections they made was not the best policy. The senior partner shifted internal personnel from collections to initial billing. Training was conducted on proper billing procedures for all staff members and the incentive policy was changed from one that focused on collections to one that focused on the reduction of billing errors. The pool of late payments that had accumulated was handed off to resources outside of the practice. Although the decision to reallocate resources and change the incentive policy was based on a partially developed model, the decision proved to be correct in that the practice's cash flow was noticeably increased and the number of bills that turned into late payments was significantly reduced.

Fourth Phase—Consolidation—Introduction of system dynamics as standard operating procedure—rule—in management practice in the firm.

In this phase, system dynamics is intended to become a standard operating procedure for management in the organization. Two examples of the types of results that the intervention has generated are new momentum policies being generated and additional recognized insights that have guided new decisions and actions in the firm.

The Momentum Policies Generated

The group, analyzing the simulation results from the different models, proposed several policies. The policies are:

1. Training programs for all levels of employees
2. Cross training in multiple skills
3. Standardizing of processes
4. Slowing down the pace of the practice

The Recognized Insights and Recommended Policies

The modeling process allowed the group to recognize insights about the practice. The insights belong to three 'major' areas. The areas are:

- Main Drivers of the Dynamics of the Practice
    - Backlog of patients was recognized as a key-leading indicator of the way the practice was performing. By concentrating in monitoring the way in which the backlog and the average time to be served behaved, the practice can take dynamic adjustments for improved performance.
    - The importance of the word-of-mouth effect in the firm's behavior was identified as another key driver of the dynamics. One participant said: "after knowing all of this, you just *cannot* concentrate on the fee schedule any more [as we did before]. You *have to* pay attention to the dynamics involved."

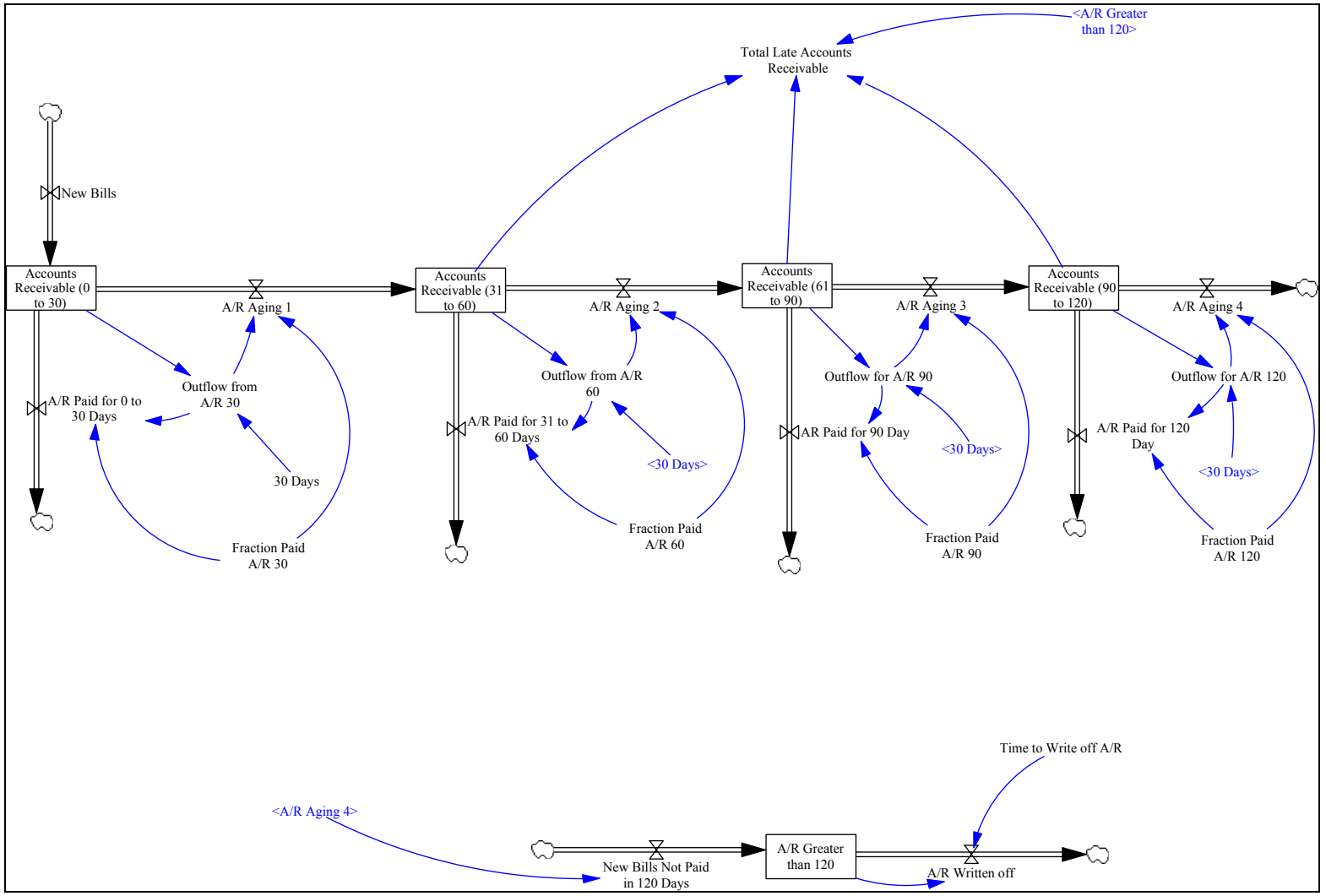

Figure 13—Part of the Structure of the Financial Sector

- Strategic Orientation of the Practice
    - Focusing on implants and recognizing the borders of their practice as 'extended' towards the referring doctors, crown technicians, and color specialists is identified as a key strategic position for the practice. Having the orientation towards implants attract more and higher-end patients that allow the practice to maintain quality levels and revenue streams. However, this new orientation is challenging because the integrated quality of the implant, as seen by the patient, includes operations outside of their 'traditional' control. The interorganizational relationships present in their practice were identified as critical to be able to control the operations.

- Innovations in Management
    - Innovations in management practices will be adopted as a rule to change existing practices such as in the case of accounts receivable. This process will be incorporated into the day-to-day analysis of operations using a system-dynamics based framework.

The Recognized Insights about how to use System Dynamics in the Firm

Besides the insights pertinent to the firm's operations, the group was able to identify some interesting insights about the use of system dynamics in the organization. In this part of the reflection, the facilitator and the modeler were very active trying to help the larger group clarify these 'nuggets' of knowledge about the intervention process. At this point, many individuals in the firm were very interested not only in what was happening but in how it was happening as well. The insights are organized in four categories:

- Types of Models
    - Trying to generate and present to the group the simplest model possible that captures the dynamics under study was considered key. This simplicity was considered very important to be able to have people relate to the model and its possible lessons. This is consistent with ideas related to 'insightful little models' (Richardson, 2000) for enhanced

understanding of dynamic phenomena. One participant expressed this by saying: "this should not be a Ph.D. exercise, it should be something that people can relate to."

- You have to clarify from the very beginning with everyone that, as Sterman (2002) mentions, *all models are wrong* and all models are limited representations of reality. This initial recognition clears the path for increased participation of the people in the firm because the level of anxiety about *requiring* a good model goes down and their creativity goes up because they realize that there is always room for improvement in the models that they are working with.

- Types of Variables
  - The types of variables that should be used are those that have an appeal to the individuals in the organization. Being able to 'talk the walk' of the firm increases the possibility of integrating the new ideas to the firm's dominant cultural stream.

- Types of Interaction
  - The interaction between the 'external' and the 'internal' people involved in the process should be as simple as possible, or at least it should be presented as simple. The use of simple tools, simple concepts, and simple mechanisms can be very powerful for the firm and can enhance the level of collaboration to make it a real solution and a new way of doing things in the organization: a new norm. These ideas are consistent with ideas relating the importance of managing the interface between the modeling group and the client group in relation the expectations of both parties (Andersen and Richardson, 1997; Haslett, 2001).

- Types of Results
  - All the dynamics that you see in large corporations evolved here. Even though this case was developed in a small health care practice with a very high degree of centralization and a high capacity to command people to do it, policy resistance and unanticipated consequences arose. The group had to internalize sufficient knowledge and confidence about the process to be a success. This confirmed us that a system dynamics intervention cannot be mandated without having unanticipated consequences that can defeat the intervention. The autonomous evolution generated in system dynamics interventions needs to be recognized and managed in order to be able to change the firm's culture.

Final Comments

This paper has presented an explanation of our experience in an ongoing organizational intervention using system dynamics modeling as the framework. This process has been both rewarding and intriguing for us. Some interesting questions have arisen from this experience. We have been trying to think if the way we have conduced this intervention is something that other practitioners could use to improve their practice. Additionally, we have identified some characteristics about our wok that make it *desirable.* These characteristics are:

1. This type of intervention seems to generate higher levels of *stickiness* of the results and benefits in the organization.
2. This intervention generates 'shared realities' for the members of the organization to consider.
3. This type of intervention tends to infuse system dynamics ideas in the day-to-day activities of the members of the organization, becoming a vehicle for cultural change affecting the 'norms' of the organization.
4. This type of intervention generates a new language that enables both a new type of dialogue in the organization and the necessary process for it to become effective. This new language and dialogue allows for the current culture to evolve towards a new culture in the organization. One very important product that system dynamics interventions generate is the creation of a new way of looking at the world and a new way to express what we see in the world. This should not be seen only as a 'by-product of our work' as Campbell (2001, p. 210) describes. In our interventions, it should be an important and desirable main product and contribution for change in the firm (for further reading about language, dialogue, and the way it influences groups and organizations see Senge, 1990; Bohm and Nichol, 1996; Isaacs, 1999).
5. New rules seem to evolve from the intervention as a natural process without having to be formalized from the beginning.

However, the disadvantages of this type of intervention seem to be:

1. This type of intervention seems to be very time consuming and potentially long (is this bad?).
2. This type of intervention generates a new power within the organization that can be 'misused' creating a 'new' culture that is not as effective as the one that was originally in place.
3. This type of intervention can be costly in time and resources.
4. This type of intervention seems to be very sensible to having a strong internal champion to work with. If you do not have a very committed internal 'champion' in the organizations the probability of success seems low.

For certain, additional research appears necessary.

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Equations of the Models

(1) Health-Care 1 Model

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   V1 1
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(002) "$/Patient High"=900
Units: Dollars/Patients

(003) "$/patient Low"=350
Units: Dollars/Patients

(004) "$/Patient Medium"=550
Units: Dollars/Patients

(005) Additions to Cumulative Patients=Outflow rate
Units: Patients/Month

(006) Adjustment time for moving staff=2
Units: Month

(007) Adjustment Time for Perception of Quality=1
Units: Month

(008) Adjustment Time for Quarterly Profits=6
Units: Month

(009) Average Out patient per group=Outflow rate
Units: Patients/Month

(010) "Average patients referred/month/referring people"=3
Units: Patients/Month/Referring people

(011) Average Quarterly Profits= INTEG (Net Change in Quarterly Profits, Estimated Quarterly Profits)
Units: Dollars/Quarter

(012) "Average Tasks/patient"="Average Tasks/patient Normal"*(1+STEP(Step in tasks, Time to step in tasks))
Units: Tasks/Patients

(013) "Average Tasks/patient Normal"=10
Units: Tasks/Patients

(014) "Average time to get experience/staff"=1
Units: Month

(015) Average Training per employee=Level Of Training/Total Staff
Units: Learning/Staff

(016) "Avg. Backlog to tasks"=Backlog of Patients/Tasks
Units: Patients/Tasks

(017) "Avg. Salary per staff per month"=4000
Units: Dollars/Month/Staff

(018) Backlog of Patients= INTEG (Inflow rate-Outflow rate,330)
Units: Patients

(019) Completion rate=Productivity*Total Productive Staff
Units: Tasks/Month

(020) Cumulative Patients= INTEG (Additions to Cumulative Patients,0)
Units: Patients

(021) Current Contact Per Month="Normal Contacts with People/Month"*Effect of the Workload Ratio on Marketing
Units: Referring people/Month

(022) Current Fraction of High patients=Desired Fraction of High patients/Total Fraction
Units: Dmnl

(023) Current Fraction of Low patients=Desired Fraction of Low patients/Total Fraction
Units: Dmnl

(024) Current Fraction of Medium patients=Desired Fraction of Medium patients/Total Fraction
Units: Dmnl

(025) Current Quality of Services=Effect of WorkLoad Ratio on Quality*Quality of Services normal

Units: Quality
(026) Desired Fraction of High patients=1/3
Units: Dmnl
(027) Desired Fraction of Low patients=1/3
Units: Dmnl
(028) Desired Fraction of Medium patients=1/3
Units: Dmnl
(029) Desired Staff=28
Units: Staff
(030) Desired training level=30
Units: Learning/Staff
(031) Effect of Reputation on Loss of referral=f Effect of Reputation on Loss of referral(Reputation)
Units: Dmnl
(032) Effect of Reputation on new referrals=f Effect of Reputation on new referrals(Reputation)
Units: Dmnl
(033) Effect of the Workload Ratio on Marketing=f Effect of the Workload Ratio on Marketing(WorkLoad Ratio)
Units: Dmnl
(034) Effect of WorkLoad onProductivity=f Effect of WorkLoad onProductivity(WorkLoad Ratio)
Units: Dmnl
(035) Effect of WorkLoad Ratio on Quality=f Effect of WorkLoad Ratio on Quality(WorkLoad Ratio)
Units: Dmnl
(036) Estimated Quarterly Profits=Months Per Quarter*Net Income
Units: Dollars/Quarter
(037) Experienced Staff= INTEG ((Gaining experience-Quitting)-Staff moving to training functions,28)
Units: Staff
(038) "Experienced Staff (Training)"= INTEG (Staff moving to training functions,0)
Units: Staff
(039) f Effect of Reputation on Loss of referral([(0,0),
(2,2)],(0,2),(0.293578,1.84211),(0.617737,1.75439),(0.776758,1.68421
),(0.954128,1.47368),(1,1),(1.11927,0.631579),(1.22936,0.45614),(1.45566,0.254386
),(1.68196,0.166667),(2,0.1))
Units: Dmnl
(040) f Effect of Reputation on new referrals([(0,0)-
(2,2)],(0,0),(0.238532,0.45614),(0.605505,0.807018),(1,1),(1.33945,1.2807),(2,1.5))
Units: Dmnl
(041) f Effect of the Workload Ratio on Marketing([(0,0)-
(2,40)],(0,30),(0.0733945,29.4737),(0.140673,27.7193),(0.238532,25.4386),(0.35474,21.5789),(0.593272,1
0.513),(0.850153,1.10526),(1,1),(2,1))
Units: Dmnl
(042) f Effect of WorkLoad onProductivity([(0,0)-
(2,2)],(0,0),(1,1),(1.27829,1.20175),(1.4,1.2),(1.6,0.947368),(1.78593,0.710526),(2,0.5))
Units: Dmnl
(043) f Effect of WorkLoad Ratio on Quality([(0,0)-
(2,2)],(0,1.2),(0.2,1.2),(0.4,1.17),(0.6,1.12),(0.8,1.06),(1,1),(1.2,0.8736),(1.4,0.712),(1.6,0.489),(1.8,0.3),(2,
0.15))
Units: Dmnl
(044) f pressure to increase training staff([(0,0)-
(2,0.1)],(0,0.02),(0.256881,0.0157895),(0.391437,0.0122807),(0.556575,0.00701754),(0.715596,0),(1,0),(2
,0))
Units: Dmnl
(045) f Pressure to Reduce Staff([(0,0)-(2,1)],(0,0.2),(1,0.75),(2,1))
Units: Dmnl
(046) f Pressure to reduce training staff([(0,0)-(2,1)],(0,0),(1,0),(2,1))
Units: Dmnl
(047) Fraction Experienced Staff Desired in Training=0.2

Units: Dmnl
(048) Fraction of Experienced Staff in Training="Experienced Staff (Training)"/Total Experienced Staff
Units: Dmnl
(049) "Fraction of referring base loss/month"=0.1
Units: Dmnl/Month
(050) Fraction patient High=Patients High/Total Patients
Units: Dmnl
(051) Fraction patient low=Patients Low/Total Patients
Units: Dmnl
(052) Fraction patient Medium=Patients Medium/Total Patients
Units: Dmnl
(053) Gaining experience=Inexperienced Staff/"Average time to get experience/staff"
Units: Staff/Month
(054) Gaining New referrals=Effect of Reputation on new referrals*Current Contact Per Month
Units: Referring people/Month
(055) In patient High=Current Fraction of High patients*New referred patients
Units: Patients/Month
(056) In Patients low=Current Fraction of Low patients*New referred patients
Units: Patients/Month
(057) In Patients Medium=Current Fraction of Medium patients*New referred patients
Units: Patients/Month
(058) Incoming task=Inflow rate*"Average Tasks/patient"
Units: Tasks/Month
(059) Increase in training benefits=Staff Learning
Units: Learning/Month
(060) Increase Staff Providing Training=Staff moved to training*pressure to increase training staff
Units: Staff/Month
(061) Inexperienced Staff= INTEG ((+New hiring rate-Gaining experience),0)
Units: Staff
(062) Inflow rate=Total Patients in
Units: Patients/Month
(063) Length of Employment=50
Units: Month
(064) Level Of Training= INTEG (Increase in training benefits-Training benefits lost when staff leaves,1677)
Units: Learning
(065) Loss of referral=Effect of Reputation on Loss of referral*"Fraction of referring base loss/month"
*Referring Base
Units: Referring people/Month
(066) Minimum Required Quarterly Profits=1000
Units: Dollars/Quarter
(067) Months Per Quarter=3
Units: Months/Quarter
(068) Net Change in Quarterly Profits=(Estimated Quarterly Profits-Average Quarterly Profits)/Adjustment Time for Quarterly Profits
Units: Dollars/Quarter/Month
(069) Net Income=Total Revenue-Total staff Cost-Other Cost
Units: Dollars/Month
(070) New hiring rate=Quitting*Pressure to Reduce Staff
Units: Staff/Month
(071) New referred patients=Referring Base*"Average patients referred/month/referring people"
Units: Patients/Month
(072) "Normal Contacts with People/Month"=22
Units: Referring people/Month
(073) Normal WorkLoad=118
Units: Tasks/Staff
(074) Other Cost=50000

Units: Dollars/Month
(075) Out Patient High=Average Out patient per group*Fraction patient High
Units: Patients/Month
(076) Out Patient low=Average Out patient per group*Fraction patient low
Units: Patients/Month
(077) Out patient Medium=Average Out patient per group*Fraction patient Medium
Units: Patients/Month
(078) Outflow rate=Completion rate*"Avg. Backlog to tasks"
Units: Patients/Month
(079) Patients High= INTEG (In patient High-Out Patient High,110)
Units: Patients
(080) Patients Low= INTEG (In Patients low-Out Patient low,110)
Units: Patients
(081) Patients Medium= INTEG (In Patients Medium-Out patient Medium,110)
Units: Patients
(082) Perception of Quality=SMOOTH(Current Quality of Services, Adjustment Time for Perception of Quality)
Units: Quality
(083) pressure to increase training staff=f pressure to increase training staff(Ratio of Avg to Desired level of training)
Units: Dmnl
(084) Pressure to Reduce Staff=f Pressure to Reduce Staff(Ratio of Average Quarterly Profits to Min Reqd)
Units: Dmnl
(085) Pressure to reduce training staff=f Pressure to reduce training staff(Ratio of Avg to Desired level of training)
Units: Dmnl
(086) Productivity=Productivity Normal*Effect of WorkLoad onProductivity
Units: (Tasks/Staff)/Month
(087) Productivity Normal=118
Units: (Tasks/Staff)/Month
(088) Quality of Services normal=1
Units: Quality
(089) Quitting=Experienced Staff/(Length of Employment*Pressure to Reduce Staff)
Units: Staff/Month
(090) Ratio of Average Quarterly Profits to Min Reqd=Average Quarterly Profits/Minimum Required Quarterly Profits
Units: Dmnl
(091) Ratio of Avg to Desired level of training=Average Training per employee/Desired training level
Units: Dmnl
(092) Ratio of Perceived Quality to Normal Quality=Perception of Quality/Quality of Services normal
Units: Dmnl
(093) Reduction in staff training="Experienced Staff (Training)"*Pressure to reduce training staff/Adjustment time for moving staff
Units: Staff/Month
(094) Referring Base= INTEG (+Gaining New referrals-Loss of referral,110)
Units: Referring people
(095) Reputation=Ratio of Perceived Quality to Normal Quality
Units: Dmnl
(096) Staff Learning=("Experienced Staff (Training)"*Trainer training Productivity)/Time for Learning to sink in
Units: Learning/Month
(097) Staff moved to training=Experienced Staff*(Fraction Experienced Staff Desired in Training-Fraction of Experienced Staff in Training)/Adjustment time for moving staff
Units: Staff/Month
(098) Staff moving to training functions=-Reduction in staff training+Increase Staff Providing Training
Units: Staff/Month
(099) Staff to hire=Desired Staff-Total Staff

Units: Staff
(100) Step in tasks=-0.2
Units: Dmnl
(101) Tasks= INTEG (+Incoming task-Completion rate,3300)
Units: Tasks
(102) Time for Learning to sink in=2
Units: Month
(103) Time to hire=1
Units: Month
(104) Time to step in tasks=3
Units: Month
(105) Total Experienced Staff="Experienced Staff (Training)"+Experienced Staff
Units: Staff
(106) Total Fraction=Desired Fraction of High patients+Desired Fraction of Low patients+Desired Fraction of Medium patients
Units: Dmnl
(107) Total Patients=Patients High+Patients Low+Patients Medium
Units: Patients
(108) Total Patients in=In patient High+In Patients low+In Patients Medium
Units: Patients/Month
(109) Total Productive Staff=Experienced Staff+Inexperienced Staff
Units: Staff
(110) Total Revenue="Total Revenue/Month from High"+"Total Revenue/month from Low"+"Total Revenue/Month from Medium"
Units: Dollars/Month
(111) "Total Revenue/Month from High"="$/Patient High"*Out Patient High
Units: Dollars/Month
(112) "Total Revenue/month from Low"="$/patient Low"*Out Patient low
Units: Dollars/Month
(113) "Total Revenue/Month from Medium"="$/Patient Medium"*Out patient Medium
Units: Dollars/Month
(114) Total Staff="Experienced Staff (Training)"+Total Productive Staff
Units: Staff
(115) Total staff Cost=Total Staff*"Avg. Salary per staff per month"
Units: Dollars/Month
(116) Trainer training Productivity=10
Units: Learning/Staff
(117) Training benefits lost when staff leaves=0
Units: Learning/Month
(118) WorkLoad=Tasks/Total Productive Staff
Units: Tasks/Staff
(119) WorkLoad Ratio=WorkLoad/Normal WorkLoad
Units: Dmnl
****
.Control
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Simulation Control Parameters
(121) FINAL TIME = 24
Units: Month
(122) INITIAL TIME = 0
Units: Month
(123) SAVEPER = TIME STEP
Units: Month [0,?]
(124) TIME STEP = 0.0625
Units: Month [0,?]

(2) Operations 1 Model

.Control
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Simulation Control Parameters
(02) FINAL TIME = 100
Units: Month
(03) INITIAL TIME = 0
Units: Month
(04) SAVEPER = 1
Units: Month [0,?]
(05) TIME STEP = 0.0625
Units: Month [0,?]
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(07) Additional Rework Required=Total Implant Completions*(1-Initial Fraction Implant Patients Satisfied)
Units: Patients/Month
(08) Additional Rework Tasks=Additional Rework Required*Tasks Required Per Rework Patient
Units: Tasks/Month
(09) Additions to Backlog of Traditional Patient Tasks=New Patients*Initial Tasks Per Traditional Patients
Units: Tasks/Month
(10) Average Patients Per Task=Backlog of New Procedure Patients/Tasks Per New Procedure Patient
Units: Patients/Tasks
(11) Average Patients Per Traditional Tasks="Backlog of Patients (Traditional Services)"/Backlog Of Traditional Patient Tasks
Units: Patients/Tasks
(12) Average Tasks Per Patient=Backlog Of Traditional Patient Tasks/"Backlog of Patients (Traditional Services)"
Units: Tasks/Patients
(13) Average Time to Complete Implant Work=2
Units: Month
(14) Backlog of New Procedure Patients= INTEG (+New Procedures Patients Entering Practice-New Procedure Patients Receiving Services,40)
Units: Patients
(15) "Backlog of Patients (Traditional Services)"= INTEG (New Patients-Patients Leaving-"Patients Leaving - Services Completed",200)
Units: Patients
(16) Backlog Of Traditional Patient Tasks= INTEG (Additions to Backlog of Traditional Patient Tasks-Traditional Tasks Completed-Task Reduction Due to People Leaving Before Procedures,Initial Tasks Per Traditional Patients*"Backlog of Patients (Traditional Services)")
Units: Tasks
(17) Delay in Receiving Services="Backlog of Patients (Traditional Services)"/"Patients Leaving - Services Completed"
Units: Month
(18) Desired Combined Backlog=1.238
Units: Month
(19) Desired Hours Per Month Worked by Gary=174
Units: Hours/Month
(20) Desired Service Delivery Delay for Implant Patients=2
Units: Month
(21) Desired Waiting Time for Services=2
Units: Month
(22) Effect of Delay Ratio on Patients Leaving=f Effect of Delay Ratio on Patients Leaving (Ratio of Actual to Desired Waiting Time)

Units: Dimensionless/Month

(23) Effect of Implant Service Delivery Delay On Patients Willingness to Wait
=f Effect of Implant Service Delivery Delay On Patients Willingness to Wait
(Ratio of Actual Delay to Desired Delay for Implant Patients)
Units: Dimensionless

(24) f Effect of Delay Ratio on Patients Leaving([(0,0)-
(4,1)],(0,0),(1,0),(1.26829,0.0344828),(1.61672,0.132184),(2.02091
,0.327586),(2.31359,0.471264),(2.73171,0.568965),(2.99652,0.603448),(4,0.6))
Units: Dimensionless/Month

(25) f Effect of Implant Service Delivery Delay On Patients Willingness to Wait
([(0,0)-(5,1)],(0,1),(1,1),(1.50523,0.954023),(1.89547,0.867816),(2.34146,
0.568965),(2.63415,0.373563),(2.91289,0.212644),(3.14983,0.103448),(3.41463
,0.0172414),(4,0),(5,0))
Units: Dimensionless

(26) Fraction of Procedure 1 Performed=Initial Fraction of Procedure 1 Performed/Total Fraction of Procedures
Units: Dimensionless

(27) Fraction of Procedure 2 Performed=Initial Fraction of Procedure 2 Performed/Total Fraction of Procedures
Units: Dimensionless

(28) Fraction of Procedure 3 Performed=Initial Fraction of Procedure 3 Performed/Total Fraction of Procedures
Units: Dimensionless

(29) Fraction of Procedure 4 Performed=Initial Fraction of Procedure 4 Performed/Total Fraction of Procedures
Units: Dimensionless

(30) Fraction of Procedure 5 Performed=Initial Fraction of Procedure 5 Performed/Total Fraction of Procedures
Units: Dimensionless

(31) Fraction of Time Spent on Implant Patients=Hours Spent With Implant Patients/Total Hours Allocated Per Month
Units: Dimensionless

(32) Fraction of Time Spent on Management Issues=Hours Spent on Management Issues/Total Hours Allocated Per Month
Units: Dimensionless

(33) Fraction of Time Spent on Traditional Patients=Hours Spent on Traditional Patients/Total Hours Allocated Per Month
Units: Dimensionless

(34) "Fraction of Time Spent Training Others (Staff and Other Doctors)"="Hours Spent Training Others (Staff and Other Doctors)"/Total Hours Allocated Per Month
Units: Dimensionless

(35) "Fraction of Time Spent With Implant Patients (Option Two)"=Hours Spent With Implant Patients/Total Patient Contact Hours
Units: Dimensionless

(36) "Fraction of Time Spent With Traditional Patients (Option Two)"=Hours Spent on Traditional Patients/Total Patient Contact Hours
Units: Dimensionless

(37) Hours Spent on Management Issues=40
Units: Hours/Month

(38) Hours Spent on Traditional Patients=108
Units: Hours/Month

(39) "Hours Spent Training Others (Staff and Other Doctors)"=2
Units: Hours/Month

(40) Hours Spent With Implant Patients=24
Units: Hours/Month

(41) Implant Patients Waiting for Completion by Their Dentist= INTEG (+New Procedure Patients Receiving Services-Additional Rework Required-Satisfactory Implant Completions,40)
Units: Patients

(42) Initial Fraction Implant Patients Satisfied=1
Units: Dimensionless

(43) Initial Fraction of Procedure 1 Performed=0.05

Units: Dimensionless

(44) Initial Fraction of Procedure 2 Performed=0.7
Units: Dimensionless

(45) Initial Fraction of Procedure 3 Performed=0.1
Units: Dimensionless

(46) Initial Fraction of Procedure 4 Performed=0.05
Units: Dimensionless

(47) Initial Fraction of Procedure 5 Performed=0.1
Units: Dimensionless

(48) Initial Tasks Per Traditional Patients=10
Units: Tasks/Patients

(49) Losses from the Referral Base=0
Units: Doctors/Month

(50) Months of Combined Patient Backlog=Total Backlog of Tasks/"Total Tasks Capable of Being Performed Per Month - All Patients"
Units: Month

(51) New Additions to Referral Base=0
Units: Doctors/Month

(52) New Patients=Traditional Patients Referred to Practice
Units: Patients/Month

(53) New Patients Referred to Practice=Referral Base*Patients Referred by Referral Base Doctors Per Month
Units: Patients/Month

(54) New Procedure Patients=Fraction of Procedure 5 Performed*New Patients Referred to Practice
Units: Patients/Month

(55) New Procedure Patients Receiving Services=New Procedure Tasks Completed*Average Patients Per Task
Units: Patients/Month

(56) New Procedure Tasks Completed=Tasks Performed Per Month on Implant Patients
Units: Tasks/Month

(57) New Procedures Patients Entering Practice=New Procedure Patients
Units: Patients/Month

(58) New Tasks Associated with New Procedure Patients=Tasks Per New Patient Procedures*New Procedures Patients Entering Practice
+Additional Rework Tasks
Units: Tasks/Month

(59) Patients Leaving="Backlog of Patients (Traditional Services)"*Effect of Delay Ratio on Patients Leaving
Units: Patients/Month

(60) "Patients Leaving - Services Completed"=Traditional Tasks Completed*Average Patients Per Traditional Tasks
Units: Patients/Month

(61) Patients Referred by Referral Base Doctors Per Month=2
Units: Patients/Doctors/Month

(62) Ratio of Actual Delay to Desired Delay for Implant Patients=Service Delivery Delay for New Procedure Patients/Desired Service Delivery Delay for Implant Patients
Units: Dimensionless

(63) Ratio of Actual Hours Per Month to Desired Hours Per Month=Total Hours Allocated Per Month/Desired Hours Per Month Worked by Gary
Units: Dimensionless

(64) Ratio of Actual To Desired Backlog=Months of Combined Patient Backlog/Desired Combined Backlog
Units: Dimensionless

(65) Ratio of Actual to Desired Waiting Time=Delay in Receiving Services/Desired Waiting Time for Services
Units: Dimensionless

(66) Referral Base= INTEG (+New Additions to Referral Base-Losses from the Referral Base,100)
Units: Doctors

(67) Satisfactory Implant Completions=Total Implant Completions*Initial Fraction Implant Patients Satisfied
Units: Patients/Month

(68) Service Delivery Delay for New Procedure Patients=Backlog of New Procedure Patients/New Procedure Patients Receiving Services
Units: Month
(69) Task Reduction Due to People Leaving Before Procedures=Patients Leaving*Average Tasks Per Patient
Units: Tasks/Month
(70) Tasks Per New Patient Procedures=15
Units: Tasks/Patients
(71) Tasks Per New Procedure Patient= INTEG (+New Tasks Associated with New Procedure Patients-New Procedure Tasks Completed,Backlog of New Procedure Patients*Tasks Per New Patient Procedures)
Units: Tasks
(72) "Tasks Per Patient Hour (Implant Patient)"=12.5
Units: Tasks/Hour
(73) "Tasks Per Patient Hours (Traditional Patients)"=16.6667
Units: Tasks/Hour
(74) Tasks Performed Per Month on Implant Patients="Tasks Per Patient Hour (Implant Patient)"*Hours Spent With Implant Patients
Units: Tasks/Month
(75) Tasks Performed Per Month on Traditional Patients="Tasks Per Patient Hours (Traditional Patients)"*Hours Spent on Traditional Patients
Units: Tasks/Month
(76) Tasks Required Per Rework Patient=5
Units: Tasks/Patients
(77) Total Backlog of Patients=Backlog of New Procedure Patients+"Backlog of Patients (Traditional Services)"
Units: Patients
(78) Total Backlog of Tasks=Tasks Per New Procedure Patient+Backlog Of Traditional Patient Tasks
Units: Tasks
(79) Total Fraction of Procedures=Initial Fraction of Procedure 1 Performed+Initial Fraction of Procedure 2 Performed+Initial Fraction of Procedure 3 Performed+Initial Fraction of Procedure 4 Performed+Initial Fraction of Procedure 5 Performed
Units: Dimensionless
(80) Total Hours Allocated Per Month=Hours Spent on Management Issues+Hours Spent on Traditional Patients+"Hours Spent Training Others (Staff and Other Doctors)"
+Hours Spent With Implant Patients
Units: Hours/Month
(81) Total Implant Completions=Implant Patients Waiting for Completion by Their Dentist/Average Time to Complete Implant Work
Units: Patients/Month
(82) Total Patient Contact Hours=Hours Spent on Traditional Patients+Hours Spent With Implant Patients
Units: Hours/Month
(83) "Total Tasks Capable of Being Performed Per Month - All Patients"=Tasks Performed Per Month on Traditional Patients+Tasks Performed Per Month on Implant Patients
Units: Tasks/Month
(84) Traditional Patients Referred to Practice=New Patients Referred to Practice*(Fraction of Procedure 1 Performed+Fraction of Procedure 2 Performed
+Fraction of Procedure 3 Performed+Fraction of Procedure 4 Performed)
Units: Patients/Month
(85) Traditional Tasks Completed=Tasks Performed Per Month on Traditional Patients
Units: Tasks/Month

(3) Financial 1 Model

.Control
****
Simulation Control Parameters

```
(02)    FINAL TIME  = 1000
        Units: Day
(03)    INITIAL TIME  = 0
        Units: Day
(04)    SAVEPER  = 1
        Units: Day [0,?]
(05)    TIME STEP  = 0.03125
        Units: Day [0,?]
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(07)    "30 Days"=30
        Units: Day
(08)    "A/R Aging 1"="Outflow from A/R 30"*(1-"Fraction Paid A/R 30")
        Units: Units/Day
(09)    "A/R Aging 2"="Outflow from A/R 60"*(1-"Fraction Paid A/R 60")
        Units: Units/Day
(10)    "A/R Aging 3"="Outflow for A/R 90"*(1-"Fraction Paid A/R 90")
        Units: Units/Day
(11)    "A/R Aging 4"="Outflow for A/R 120"*(1-"Fraction Paid A/R 120")
        Units: Units/Day
(12)    "A/R Greater than 120"= INTEG (+New Bills Not Paid in 120 Days-"A/R Written off",New Bills Not Paid
        in 120 Days*"Time to Write off A/R")
        Units: Units
(13)    "A/R Paid for 0 to 30 Days"="Outflow from A/R 30"*"Fraction Paid A/R 30"
        Units: Units/Day
(14)    "A/R Paid for 120 Day"="Outflow for A/R 120"*"Fraction Paid A/R 120"
        Units: Units/Day
(15)    "A/R Paid for 31 to 60 Days"="Outflow from A/R 60"*"Fraction Paid A/R 60"
        Units: Units/Day
(16)    "A/R Written off"="A/R Greater than 120"/"Time to Write off A/R"
        Units: Units/Day
(17)    "Accounts Receivable (0 to 30)"= INTEG (+New Bills-"A/R Aging 1"-"A/R Paid for 0 to 30 Days",New
        Bills*"30 Days")
        Units: Units
(18)    "Accounts Receivable (31 to 60)"= INTEG ("A/R Aging 1"-"A/R Aging 2"-"A/R Paid for 31 to 60
        Days","A/R Aging 1"*"30 Days")
        Units: Units
(19)    "Accounts Receivable (61 to 90)"= INTEG ("A/R Aging 2"-"A/R Aging 3"-AR Paid for 90 Day,"A/R
        Aging 2"*"30 Days")
        Units: Units
(20)    "Accounts Receivable (90 to 120)"= INTEG ("A/R Aging 3"-"A/R Aging 4"-"A/R Paid for 120 Day","A/R
        Aging 3"*"30 Days")
        Units: Units
(21)    AR Paid for 90 Day="Outflow for A/R 90"*"Fraction Paid A/R 90"
        Units: Units/Day
(22)    "Fraction Paid A/R 120"=0.1
        Units: Dimensionless
(23)    "Fraction Paid A/R 30"=0.8+step(0.15,25)
        Units: Dimensionless
(24)    "Fraction Paid A/R 60"=0.7
        Units: Dimensionless
(25)    "Fraction Paid A/R 90"=0.6+step(0.35,100)
        Units: Dimensionless
(26)    New Bills=30
        Units: Units/Day
```

(27) New Bills Not Paid in 120 Days="A/R Aging 4"
Units: Units/Day

(28) "Outflow for A/R 120"="Accounts Receivable (90 to 120)"/"30 Days"
Units: Units/Day

(29) "Outflow for A/R 90"="Accounts Receivable (61 to 90)"/"30 Days"
Units: Units/Day

(30) "Outflow from A/R 30"="Accounts Receivable (0 to 30)"/"30 Days"
Units: Units/Day

(31) "Outflow from A/R 60"="Accounts Receivable (31 to 60)"/"30 Days"
Units: Units/Day

(32) "Time to Write off A/R"=245
Units: Day

(33) Total Late Accounts Receivable="Accounts Receivable (90 to 120)"+"Accounts Receivable (61 to 90)"+"Accounts Receivable (31 to 60)"
+"A/R Greater than 120"
Units: Units

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