Microsystems in Health Care

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Part 7. The Microsystem as a Platform for Merging Strategic Planning and Operations

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As stated at the outset of the Microsystems in Health Care series, the health system is composed of a few basic parts—front-line clinical microsystems, overarching macrosystems, and patient subpopulations needing care.[1 (Part 1)] Microsystems thinking makes several organizational assumptions:

1. Bigger systems (macrosystems) are made of smaller systems
2. These smaller systems (microsystems) produce quality, safety, and cost outcomes at the front line of care
3. Ultimately the outcomes of the macrosystem can be no better than the microsystems of which it is composed[1]

In addition, the microsystem is the logical locus for linkage between vision and delivery and therefore can and should act as the "agent for change" within a macrosystem. If strategically driven and if the performance of each individual microsystem is optimized, the microsystems within a macrosystem can facilitate systematic transformation at all levels of the system.

This article describes how the microsystem, as an agent for change, plays a critical and essential role in developing and deploying the macrosystem's strategic plan.

Strategic Planning and Microsystems Thinking

The critical need for an organization to have a strategic plan is well established. A well-designed strategic plan supports the organization's mission, vision, and values. It should be the result of an organization's careful evaluation of its position in the marketplace based on the parameters of service, quality, access, scope, innovation, and demographics.[2] An organization cannot be

Article-at-a-Glance

Background: The microsystem, as agent for change, plays a critical and essential role in developing and deploying the macrosystem's strategic plan.

Strategic planning and microsystem thinking: To effectively deploy a strategic plan, the organization must align the plan's goals and objectives across all levels and to all functional units. The concepts of microsystem thinking were the foundation for the journey on which Overlook Hospital/Atlantic Health System (Summit, NJ) embarked in 1996. Six stages can be identified in the development of the relationship between macrosystems and microsystems. Five critical themes—trust making, mitigation of constraints and barriers among departments and units, creation of a common vocabulary, raising of microsystem awareness, and facilitation of reciprocal relationships—are associated with these stages.

Notes from a microsystem journey: The emergency department (ED) experienced Stage 1—The Emergence of a Self-Aware Microsystem—as it created cultural and behavioral change, which included the actualization of staff-generated ideas and an ongoing theme of trust making. In Stage 3—Unlike Microsystems (Different Units) Learn to Collaborate—the ED's microsystems approach spread to other units in the hospital. Collaboratives addressed x-ray turnaround times, admission cycle times, and safety initiatives.

Summary and conclusions: The microsystem—the small, functional, front-line units—is where the strategic plans become operationalized.

everything to everyone and must identify the goals and objectives that best position it in the marketplace toward achieving success.[2] The strategic plan identifies the organization's chosen approach to achieving these goals and objectives.

If a strategic plan is to be effectively deployed, the organization must align the plan's goals and objectives across all levels and to all functional units. Even the best-developed strategy can become diluted as it travels through the organization—as the staff members in different units who must execute the plan interpret it on the basis of their perspectives of the goals and objectives.[3] Aligning employees with the company's strategy is the most important and most challenging task facing any organization.[4] New and innovative solutions are needed to diffuse the organizational strategic plan. Historically, organizations have not used structured approaches to translate high-level strategy statements into specific measures.[5]

Microsystems have clinical and business aims, policies-in-use, linked processes, and a shared information environment, and they produce services and care, which can be measured as performance outcomes. These systems evolve over time and are often embedded in larger systems/organizations. As any living, adaptive system, the microsystem must (1) do the work, (2) meet staff needs, and (3) maintain itself as a clinical unit.[6]

Effective microsystems have similar optimal characteristics: leadership, culture, macro-organizational support, patient focus, staff focus, interdependence of care team, information and information technology, process improvement, and performance patterns.[1] The microsystems framework provides practical steps for designing or redesigning microsystems to perform optimally in alignment with the strategic plan. As explained in a previous article in the Microsystems in Health Care series, the starting place for the design or redesign of clinical microsystems is always to evaluate the four P's: the patient subpopulations that are served by the microsystem, the people who work together in the microsystem, the processes the microsystem uses to provide services, and the patterns that characterize the microsystem's functioning.[6]

The concepts of microsystems thinking have been the foundation for the journey on which we in the emergency department (ED) of Overlook Hospital/Atlantic Health System (Summit, NJ) embarked in 1996. In the course of this experience, we have identified six stages in the microsystem journey. Each stage is richer than the previous one in complexity and allows for more collaboration (see Sidebar 1, above).

In the following section we discuss five themes in the context of the six microsystem stages and describe some of the approaches and tools we have used and developed.

In the work of developing and deploying strategic plans, macrosystems and microsystems are well served to maintain feed-forward and feed-back loops so new information can flow into future macrosystem planning, which can then be deployed at the microsystem level. Multiple feed-back loops represent the movement of information in multiple directions between the microsystems and macrosystems, thereby allowing for continuous assessment and reassessment. We have developed a model for feed-forward and feed-back loops in the work of strategic planning and the work of the microsystem (Figure 1, page 454).

Sidebar 1. Six Stages and Five Themes

Six stages can be identified in the development of the relationship between macrosystems and microsystems:

1. A self-aware microsystem (m_1)
2. A group of like microsystems (m_1+ m_1+ m_1)
3. A group of unlike microsystems (m_1+m_2+m_3)
4. A group of microsystems in relationship with a macrosystem (m_1+m_2+m_3...+M_1)
5. A group of like macrosystems (M_1+ M_1+ M_1...)
6. A group of unlike macrosystems (M_1+ M_2+ M_3...)

Five critical themes that play a role in the stages can be identified:

1. Trust making
2. Mitigation of constraints and barriers among departments and units
3. Creation of a common vocabulary
4. Raising of microsystems awareness
5. Facilitation of reciprocal relationships

The Microsystem/Macrosystem Strategic Plan Feed-Back System

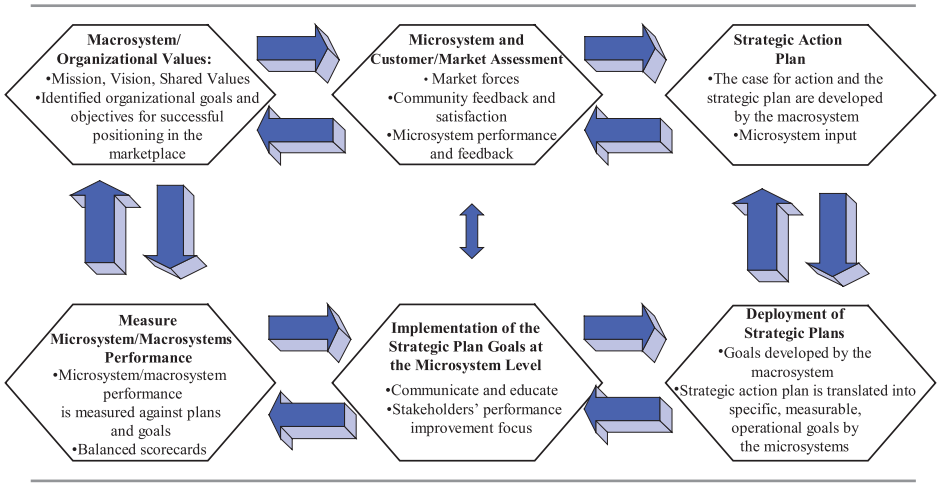


Figure 1. *In this model for feed-forward and feed-back loops in the work of strategic planning and the work of the microsystem, feed-back loops represent the movement of information in multiple directions between the microsystems and macrosystems, thereby allowing for continuous assessment and reassessment.*

Notes from a Microsystem Journey

Stage 1: The Emergence of a Self-Aware Microsystem (m_1); Critical Theme: Trust Making

Our work philosophy had developed with a strong emphasis on understanding and improving the care processes to maximize patient satisfaction. We emphasized the role of senior leadership in the ED's success by making the goal of improving ED patient satisfaction part of the organization's strategic plan. We used process improvement approaches such as a patient satisfaction summit and an ED patient satisfaction lab to create cultural and behavioral change (see Sidebar 2, page 455).

Development of Awareness of Ourselves as a "Self-Aware Microsystem" (m_1). We had often thought of the ED as representing a sort of "hospital in miniature" and therefore immediately related to the principles of microsystems thinking at the time of our first "imprinting" at an Institute for Healthcare Improvement (IHI) Forum in 1999, when the concept of microsystems in health care was presented.[7] We recognized that we had intuitively begun to manage the ED as a microsystem. We saw that enterprisewide strategic plans could be operationalized on a unit level in our ED hospital-in-miniature by translating what we, in retrospect, would term *macrosystem* to what we would now term *microsystem* level.

For example, patient satisfaction is a strategic goal of both the hospital and the hospital system. In translating it to the ED, we looked for high-leverage changes that could actualize the overall strategic goal, such as the development of a fast-track system, bedside registration, support-services cycle times, and opportunities for structural and environmental improvements. A cultural revolution to support change was driven by addressing workplace quality issues and a reward and recognition program.

A clinical improvement initiative started off with improvements in pain management that contributed to patient satisfaction. Many of the process improvements were targeted at not only reducing waits and delays but also improving the underlying clinical processes that drove them. The bulk of these high-leverage changes emerged from the patient satisfaction summits.

The ED's goals were consistent with the organization's strategic goals. As a result, we were increasingly able to secure administrative support for our initiatives. The ED had undergone the cultural change of microsystems thinking—it had become a self-aware microsystem.

Life as a Self-Aware Microsystem. We created monthly microsystem meetings, which are part retreat and part working group. They are interdisciplinary as well as interdepartmental, with representation from various units in the hospital, depending on the agenda. Some of these microsytems appear to have become self-aware in the course of these meetings. The microsystem's customers, such as patients, families, and attending physicians, may also attend these meetings, at which practical and innovative tools such as storytelling, root cause analysis (RCA; for near-miss events and patient and staff complaints), "appreciative inquiry" (use of RCA for positive outliers), and simulation are deployed. Each meeting lasts four to five hours, but a meeting saves an estimated two to three

Sidebar 2. Process Improvements

Patient Satisfaction Summit (in Retrospect, a Microsystem Summit).

In September 1997 we brought together the entire ED for a mandatory meeting in which the current patient survey tool, its methodology, and baseline data were the centerpiece and the agenda. Interdisciplinary work groups were created along the lines of the survey subsections—for example, perceptions of experience of triage, registration, physician, nursing, and ancillary care. These groups met with facilitative support during the summit and reported their ideas to their peers. This was not easy because the staff was convinced that the summit was the precursor to another budget cut or downsizing. It took the summit's successes (as evidenced by progressive increases in patient survey scores, which led to two national awards) to bring about cultural change.

The single greatest cultural change force we have ever experienced is the power of the actualization of staff-generated ideas. At annual follow-up ED summits, we reviewed the cumulative results of the previous summits. We have instituted more than 80% of the staff's recommended ideas. The staff remembers and takes pride in the ideas it has contributed, and ideas are very often credited, by the group, to the individuals who proposed them. In the course of the summit work, the ED microsystem learned to trust its instincts, and an ongoing theme of trust making began to emerge.

ED Patient Satisfaction Lab (in Retrospect, a Microsystem Research Laboratory)

In 2000 we created a patient satisfaction lab—a permanent, designated space with appropriate signage, in which patient surveys are reviewed on a biweekly basis and action plans are developed in collaboration with senior management. Staff and management have been able to work together and devote individualized attention to the ED units (such as nursing, physicians, ancillary care) whose performance is evaluated on the surveys.

times that amount of time because many other meetings can be folded into the multipurpose microsystem meeting.

The ED, in collaboration with the performance improvement department, the performance improvement committee, and hospital leadership, conducts an annual appraisal of the linkage of the ED microsystem work and the enterprisewide strategic plan.

Stage 2: The Realization of the Potential for Learnings Between Similar Microsystems (m_1+ m_1+ m_1); Critical Themes: Trust Making, Mitigation of Constraints and Barriers Among Departments and Units, and Creation of a Common Vocabulary

The ED learned from similar microsystems—other EDs—through the IHI Breakthrough Series Collaboratives—Reducing Waits and Delays (1998) and Improving Patient Satisfaction in the ED (1999). We immediately realized that that ED collaborative work in the IHI model represented microsystem-to-microsystem collaboration. Through these two collaboratives, more than 50 teams, all from EDs, achieved and sustained significant levels of improvement in clinical and operational processes. This work represented an opportunity for actualization of the strategic goals of their host institutions' macrosystems. For the most part, the strategic intents of the parent macrosystems in relationship to the ED were remarkably similar.

In the course of the collaboratives, like microsystems (m_1+ m_1+ m_1) developed a common vocabulary for change as well as a common understanding of the barriers and constraints in ED process improvement. It was then possible to share and replicate best practices and change concepts among these like microsystems.

Stage 3: Unlike Microsystems (Different Units) Learn to Collaborate (m_1+m_2+m_3); Critical Theme: Facilitation of Reciprocal Relationships

The success of the microsystems approach in the ED led to its expansion to other units of the hospital, with the goal of deploying the organization's strategic goals of achieving high levels of patient safety and satisfaction. We did this work in the context of mini-internal (to the health system) collaboratives, which included decreasing x-ray turnaround times and admission cycle times as well as safety initiatives (see Sidebar 3, page 456).

The collaborative approach to admission management described in Sidebar 3 requires unlike microsystems to work together toward a common goal. Access to information is an important component of highly successful microsystems[8] and requires real-time data collection and

Sidebar 3. Mini-Internal Collaboratives

Reduction of X-ray Turnaround Times Initiative

The initiative to reduce x-ray turnaround times, which began in 1996, required the cooperation of the ED and the radiology department. The collaboration of these two microsystems resulted in a redesigned process:

1. Reduced errors made by emergency physicians in interpreting radiographs (reduced rate of false-negatives for the 67,111 cases studied from November 1996 to December 1999 from > 3% to 0.3%)

2. Improved patient satisfaction (percentile ranking of the items on the patient satisfaction survey relating to radiology rose from the 12th percentile to above the 90th percentile)

3. Improved ED and private attending satisfaction with the plain x-ray cycle times*

Reduction of Admission Cycle Times Initiative

Early on in the ED's initiative to reduce hospital-wide admission cycle times, which began in 1997, it became apparent that the initiative's success depended on support from the health system's senior leaders. In an important feed-back loop, the ED persuaded the macrosystem that an organizational strategic initiative to decrease admission cycle time was imperative to the organization's well-being and efficiency. As evidence of the organization's commitment, the initiative became an indicator on Overlook Hospital's (macrosystem) balanced scorecard.

Tackling this process improvement opportunity required that a broad spectrum of unlike microsystems work together. The relationship between the ED and various patient care units was influenced by collaboration (or lack of collaboration) between several other support microsystems, including environmental services, which cleans the beds; bed control, which assigns the appropriate bed; and the physician, who has made the decision to admit.

The first challenge of this unlike-microsystems team was to create the will to be successful. One of the tools used to achieve this goal was the patient satisfaction survey. Prolonged admission cycle times contributed not only to decreased ED satisfaction—and reduced ED efficiencies—but to decreased inpatient satisfaction scores. Patients who wait for a bed in the ED come to the inpatient unit with a negative attitude about the facility, which will persist in spite of the staff's best efforts. A fair and open analysis and discussion of data was seen to be important in fostering the will to succeed. Data collection will predictably show that a percentage of the burden of delay is on each side of the microsystem/macrosystem interface.

Cycle times of an hour or less—from the time that the decision is made to admit the patient to the time that the patient is admitted—were achieved following these interventions:

- The "Czarina of bed control" concept was instituted. The "Czar(ina)" is the administrative leader who accepts ultimate responsibility for following up with units that have chosen not to cooperate with the ED in this process.
- The bed-control processes were placed under the ED management to allow the ED to monitor, identify, and mitigate bed-management problems in real-time. This intervention was responsible for eliminating discharge holding.
- Registration and housekeeping were decentralized.
- A standardized documentation tool was developed that required the unit nurse not to fully reevaluate the patient but rather to read the ED documentation.
- A "nonverbal" report form was developed. We found that giving verbal reports was the greatest opportunity for process delay because it required that the unit nurse leave the patient to answer the phone. If the ED documentation is appropriate, the nonverbal report should be the only information the unit staff will need to take care of the patient for the first 30 minutes (in terms of pumps, air mattress, and so on).

The benefits of successful management of admission cycle times, which is usually a budget-neutral solution, were significant, including the reduction, if not elimination, of ED holding and diversions of patients to other EDs.

* Espinosa J.A., Nolan T.W.: Reducing errors made by emergency physicians in interpreting radiographs: Longitudinal study. *BMJ* 320:737–740, Mar. 18, 2000.

monitoring to provide timely feedback to all or any of the microsystems involved.

Stage 4: The Emergence of a Group of Microsystems in Relationship with a Macrosystem ($m_1+m_2+m_3...+M_1$); Critical Themes: The Facilitation of Reciprocal Relationships and Raising of Microsystems Awareness

The experience and success of microsystems collaboration achieved by reducing admission cycle times led in 2000 to the desire for greater collaboration, as manifested in a robust demand-capacity management system (DCMS)—a way of matching resources to stress loads.

The obvious result of a DCMS is a reduction in incidents of overload starting with inpatient services "meltdown" and manifested by diversions of patients to other EDs and bypassing the ED to more distant locations. The often-unnoticed by-products of a DCMS include the ability to diffuse best practices across microsystems and macrosystems and decreased variation in practice patterns.

A successful DCMS will produce many benefits:

- Increased customer confidence and satisfaction will result from reductions in waits and delays and increased staff satisfaction (improved staff recruitment and retention)
- An overall sense of collaboration will permeate the organization as an institutional memory is generated from the successful development of this synergy of microsystems with the macrosystem
- A safer system that is more stable and reliable facilitates the monitoring, prevention, and mitigation of stress loads, thereby returning control to the system and empowering the staff
- Capacity becomes available in the form of stretchers, appointments, and procedure times

We worked with the microsystems, using the principles of the communication methodology crew resource management.[9] We used human factors principles to develop a DCMS that generated a safer environment to support the macrosystem's goal to be a safer system.

In developing a DCMS, we needed to first identify and then understand the impact of stress loads (states) on the system. Taking crew resource management to a higher order of complexity, we defined DCMS states and developed interventions to compensate and recover design capacity. The demand and capacity states were given colors in relationship to the conditions, loads, and stressors current at a particular time. Each state had criteria with matching interventions for management and mitigation:

- *Green* reflected optimal functioning; staffing matches the patient or procedure load, and there is collaboration between all microsystems within the macrosystem
- *Yellow* reflects early triggers and allows the system to initiate early intervention
- *Orange*, which represents escalating demand without readily available capacity, signals that aggressive action is required to avoid system overload and ultimate gridlock
- *Red* represents system gridlock and calls for deployment of the organizational disaster plan

Green is the goal level, with all interventions focused on achieving and maintaining this state of equilibrium. These states were linked with matching interventions, which were further divided into four categories of indicators: census (unit counts for work load), acuity (level of stress specific to population, procedures, or specimens, often in terms of turnaround time), other indicators pertinent to the status of information systems and supplies, and staffing (status and matching of staff to demand). The indicators are specific to the particular microsystem and make up that microsystem's "grid." Each of 44 participating microsystems in the system faxes its grid twice a day; the Bird's-Eye View (Figure 2, page 458) is displayed at the nurses' station.

The success of a DCMS must be measured to achieve widespread acceptance. Overlook Hospital has enjoyed > 90% retention of nurses since the program's initiation in January 1999. Admission cycle times continue to be tracked and monitored, and they frequently average < 60 minutes. Through a collaborative approach to demand/capacity decision making, the macrosystem has progressed from being on divert several times a week to no such episode within more than a year (Figure 3, page 459).

Stage 5: A Group of Like Macrosystems Can Work Together in the Context of Microsystem Theory ($M_1+ M_1+ M_1...$); Critical Themes: The Facilitation of Reciprocal Relationships, Trust Making, and Creation of a Common Vocabulary

Microsystem theory and principles have diffused across our system, creating collaboration not only between microsystems but also between similar

macrosystems. A focus on the macrosystem-level strategic goals has been maintained.

A DCMS has been created among all four hospitals in the Atlantic Health System. We created standard grids between common microsystems such as a single grid for the four lab programs. We also created common grids for 15 other microsystems, including respiratory, engineering, and perioperative services. We have also used the organization's strategic initiatives of service lines and common goals (for example, improving falls management) to unite our macrosystems.

Stage 6: Unlike Macrosystems Learn to Work Together Just as Unlike Microsystems Learned to Function Collaboratively (M_1+ M_2+ M_3); Critical Themes: The Facilitation of Reciprocal Relationships, Trust Making, and Creation of a Common Vocabulary

An exciting new area of microsystem/macrosystems thinking has emerged—that of unlike macrosystems working together. Examples in the system include the creation of DCMS grids between hospitals and nursing homes, rehabilitation facilities, and physician offices. This collaboration has created common initiatives in cardiac and neuroscience management and commnitywide safety and customer satisfaction programs. Macrosystems thinking has enhanced the development of community disaster plans.

We suggest that some of the deepest practical payoffs of microsystems theory may occur in the context of scaled-up applications of the theory—where the macrosystem of interest might be regional or national in scope and where the strategic plan is at the public-policy level.

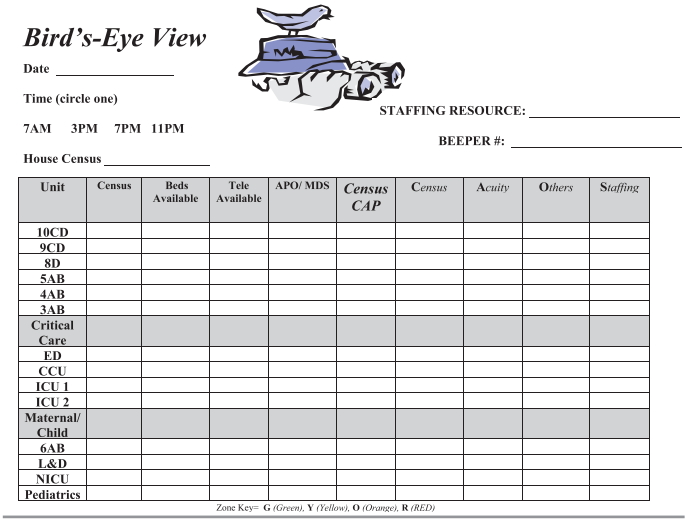
Keys to Success: The Critical Themes

Five themes drove the ED microsystem's development.

1. Trust Making

It is important at the outset of a microsystem's development to create an embedded predisposition to trust. According to family therapist Virginia Satir [1916–1988], trust entails learning, for example, to communicate clearly, to cooperate rather than compete, to empower rather than subjugate.[10]

Bird's-Eye View



Bird's-Eye View

Date _____

Time (circle one)

7AM 3PM 7PM 11PM

House Census _____

STAFFING RESOURCE: _____

BEEPER #: _____

Unit	Census	Beds Available	Tele Available	APO/ MDS	*Census CAP*	*Census*	*Acuity*	*Others*	*Staffing*
10CD									
9CD									
8D									
5AB									
4AB									
3AB									
Critical Care									
ED									
CCU									
ICU 1									
ICU 2									
Maternal/ Child									
6AB									
L&D									
NICU									
Pediatrics									

Zone Key= **G** *(Green)*, **Y** *(Yellow)*, **O** *(Orange)*, **R** *(RED)*

Figure 2. *The state of participating microsystems is shared twice a day by faxing the Bird's-Eye View.*

2. Mitigation of Constraints and Barriers

By reducing impedance to flow within and between microsystems, collaboration will result. A DCMS is ideal for breaking down barriers and facilitating collaboration.

3. A Common Vocabulary

A common vocabulary, derived mostly from everyday words in the context of new or shared syntax, encourages interaction and conversations about collaboratively seeking to solve problems. It frames activities as "shared." For example, the color coding and terminology of our DCMS is part of our common vocabulary.

4. Raising of Microsystems Awareness

The awareness of the presence of microsystems in the context of macrosystems is, in our experience, a powerful notion with far-reaching implications for improving the efficiency of change. The result is a sense of family and community (a willingness to adapt to situations and protect others).[11,12]

5. Reciprocal Action and Fair Trade

The willingness and openness to support reciprocal action within a macrosystem is similar to the concepts of fair trade within a social economy. Optimal tools to create this fair-trade agreement drive the alignment of the strate-

Days Since Last Divert

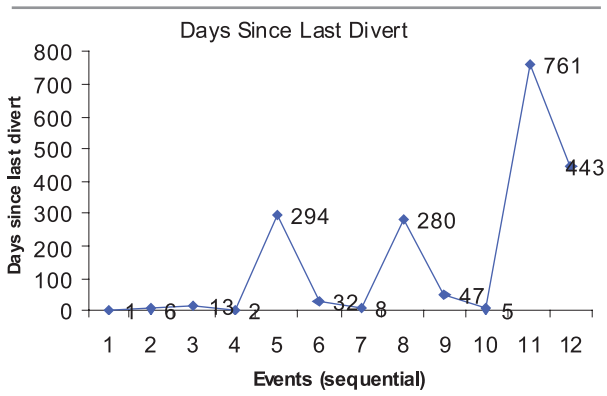


Figure 3. *Through a collaborative approach to demand/capacity decision making, the macrosystem has progressed from being on divert several times a week to no such episode within more than a year.*

gic plan between the microsystems, macro-organizations, and megasystems. These tools include the microsystem management meetings themselves, retreats, collaboratives, idealized designs, summits, DCMS, balanced scorecards, and storytelling.[13]

The fair-trade metaphor supports the idea that members need to trade with one another. If a member does not participate, the system will deny that member the benefits of trading—or in this case, collaborating. Those nonparticipating microsystems are then forced to seek support or relief from "stress" from other nonparticipating microsystems. Ultimately the value of participation will drive all microsystems to participate simply to survive as well as to be a part of the community with its associated family relationship.

Summary and Conclusions

New and innovative solutions are needed to diffuse and enact an organizational strategic plan. In this article, we have shared our enthusiasm for the microsystem as the place to operationalize. The microsystem is the logical locus for linking vision with delivery; microsystems can and should act as the units for change.

Six stages were identified in the development of the relationship between macrosystems and microsystems, with an associated notational system to illustrate the patterns in utilizing combinations of microsystem and macrosystem relationships in deploying the macrosystem's strategy. Five critical themes variously associated with these stages are trust making, mitigation of constraints and barriers among departments and units, creation of a common vocabulary, raising of microsystems awareness, and facilitation of reciprocal relationships.

To conclude, we offer some "future-think": Some of the deepest practical payoffs of microsystem theory may occur in the context of scaled-up applications of the theory, where the macrosystem of interest might be regional or national in scope and where the strategic plan is at the public-policy level. J

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