CONCEPT MAPPING:
Viewing change within a Fire Department

EXECUTIVE DEVELOPMENT

By: C. Nicholas Heimlich
Springfield Fire Rescue Division
Springfield, Ohio

An applied research project submitted to the National Fire Academy
as part of the Executive Fire Officer Program

February 2003

ABSTRACT

This research project applied a qualitative research methodology as an internal environmental scan. The Springfield Fire Rescue Division (SFRD) had identified that it lacked a meaningful mechanism to assess the impact on and the current status of, the internal organization environment relative to implementation of a new and radically different service delivery model. The purpose of the project was to apply data mining and visualization techniques in a process identified as Concept Mapping to an analysis of the cultural environment of the SFRD.

This project utilized descriptive research to answer three specific questions: (a) is qualitative research appropriate for informing the leaders and members of a public safety organization on the impact of change to that organization, (b) what specific qualities of data mining and information visualization found in Concept Mapping lend themselves to effectively communicating aggregation and characterization of complex, qualitative data about the organization to leaders and members, and (c) how can existing theoretical approaches contribute to understanding the current status of the Springfield Fire Division's organizational culture within the context of response to change?

A purposive, non-probability sampling of 11 SFRD personnel was employed. Participants were instructed to describe the recently reengineered service delivery process. Individual responses were then compiled, redistributed and grouped by each participant according to their personal assessment of similarity or relatedness. Finally the statements were ranked by each participant using a Likert 4 point scale, as to overall importance to the SFRD and again as to feasibility of application. Data on all responses were compiled and analyzed utilizing SPSS, Inc. software. Cluster maps with boundary

analysis and dimensional layering were created to analyze the relationships between the various conceptual perspectives.

This project found that qualitative research could assist in identifying and structuring a wide variety of conceptual responses into a coherent framework. The research further identified significant congruence between the specific SFRD conceptual mapping results and the projections identified by the literature review of organizational culture under change.

Recommendations which resulted from this research included an identified need to (a) involve the whole organization when directing change, (b) focus on the ideological involvement of organization members in the change effort, (b) establish highly visible and well communicated goals and objectives, (c) improve current and future change actions by identifying and addressing the counter culture currently present.

TABLE OF CONTENTS

ABSTRACT	2
TABLE OF CONTENTS	4
INTRODUCTION	5
BACKGROUND AND SIGNIFICANCE	6
LITERATURE REVIEW	11
PROCEDURES	15
RESULTS	18
DISCUSSION	22
RECOMMENDATIONS	26
REFERENCES	31
APPENDIX A (Concept Statement Response Sheet)	34
APPENDIX B (Concept Statement and Rating List #1-23)	35
APPENDIX C (Concept Statement and Rating List #24-55)	36
APPENDIX D (Concept Statement Sorting Sheet)	37
APPENDIX E (Group Cluster Map with Importance Layering)	38
APPENDIX F (Group Cluster Map with Feasibility Layering)	39

INTRODUCTION

The Springfield Fire Rescue Division (SFRD) implemented a major reengineering of service delivery methods effective January 1, 2002. While quantitative data is becoming available which supports a positive interpretation of the service inputs and outputs, much internal anecdotal information indicates dissatisfaction with the new system. The SFRD has identified a problem in that it lacks a meaningful mechanism to assess the impact on and the current status of, the internal organization relative to implementation of the new service delivery model.

The purpose of this descriptive research project is to apply a qualitative research process known as Concept Mapping to assessment of the Springfield Fire Rescue Division's organizational response in the context of a specific change environment.

This research asks the following questions:

1. Is qualitative research appropriate for informing the leaders and members of a public safety organization on the impact of change to that organization?
2. What specific qualities of data mining and information visualization found in Concept Mapping lend themselves to effectively communicating aggregation and characterization of complex, qualitative data about the organization to leaders and members.
3. How can existing theoretical approaches contribute to understanding the current status of the Springfield Fire Division's organizational culture within the context of response to change?

BACKGROUND and SIGNIFICANCE

Precipitating Factors

In late 1999, the City of Springfield, Ohio and Springfield Township of Clark County, Ohio signed a Community Economic Development Agreement (CEDA) stipulating the future process of shared service delivery and shared tax revenue for areas subject to annexation. All future areas to be included under this agreement as "annexed" would receive the benefit of Springfield Fire and EMS service. The greatest challenge to the Fire Division lay in this new understanding that annexed areas need not be contiguous to the existing City jurisdictional boundaries. These services may have to be delivered to a variety of isolated areas, across intervening Township areas without the benefit of the traditional zone style service delivery profile (zone: an area of coverage with a designated unit(s) which can shift to cover unmet service needs in adjacent areas) traditionally utilized. The Fire Service has traditionally relied upon the zone style of service delivery to maintain effective response times and adequate capacity across broad areas with regular but unpredictable Fire or EMS service needs. It was also general knowledge at the time of the CEDA implementation that such annexations would not be immediate in nature but would most likely develop within 2 to 5 years.

One final factor surfaced early in 2000, an inquiry by Springfield Township Trustees as to the interest of the City in providing EMS service to all of Springfield Township, an area contiguous to approximately 75% of the City perimeter boundary. The interest was expressed as "immediate" and both the City Administration and the Fire Division were interested in responding positively to this request.

To provide the variety and capacity of standard Fire and EMS services with the reliability and efficiency expected (based upon current citywide experience) to isolated areas with lower aggregate service needs would seriously challenge the existing Fire Division organization. The Fire Division had to commit to preparing to meet such a challenge or elect not to respond.

Upon first presentation, the ability of the Fire Division organization to respond immediately to service adjustments was seriously questioned. Without a precedent situation, standard Civil Service hiring practices and pre-deployment training and certification requirements seemed to indicate that the reflex time of the organization would be 6 months at a minimum, which in turn would depend upon the actual budget impact of such a process. Finally, the present possibility carried the potential for some implied future immediacy should the request for service be tabled to a latter date.

The Realignment Program Process

Following a meeting of the various Division Chiefs and Assistant City Manager, a decision was reached to implement a Management Team to address the issues at hand. It was decided that the Management Team should include, all Officers with administrative responsibility throughout the Fire Division. Representation by Local 333 International Association of Firefighters was also encouraged. Organizationally this meant Union representation, Captains, Battalion Chiefs, Assistant Chiefs and the Chief of the Division. The final team membership list included 17 personnel. The Team would physically represent approximately 13% of total Division personnel. One critical factor supporting inclusion of the Captains was the identified need to expand their role in the organization from that of primarily task level to one of midlevel management. Inclusion in the

development of strategic planning and policy would, it was believed, support the Captains in appreciating and adopting their new role.

In May of 2000, the first Interests and Issues brainstorming session was held. The process involved essentially a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the present situation and potential for proactive response. Over the course of the next 18 months, meetings of the management team were held quarterly. It was clear within a few months that Springfield Township was not sincerely interested in subcontracting the EMS service and so the immediate urgency of the situation was removed. It was determined that the process should continue based upon the desire to design a standing system that would be better prepared to meet such a contingency in the future.

The process culminated in the development of a deployment model, which focused on a primary company of personnel provided with resource capacities for both Fire and EMS incident response. Five of these companies were proposed, with a sixth to be implemented within one year afterward. Four dedicated fire response companies would support these five combination companies to ensure adequate response and staffing capacity for working fire incidents. Where ambulances previously had been staffed by two personnel, and fire companies by three, now all companies would have a minimum of three personnel one of which would be the directing officer.

The plan was implemented on January 1, 2002.

Contemporary Currents

Several unanticipated factors impacted the implementation of the realignment process. The first being the strong reinforcement of the traditional role paradigm

precipitated by the September 11, 2001 attack on the World Trade Center and the subsequent “nationalization” of identification with the “Firefighter”. The ground swell of unconditional support contributed to a sense of suspension regarding the necessity of discussions focusing on change in the future of the Fire Service as a public safety agency. This in turn increased the cognitive dissonance in the Fire Division ranks between that recognized and desired role as “Firefighter” and the proposed role as a multitasking public safety agent.

A second unanticipated factor revolved around the implementation of a new electronic reporting software program in November of 2001. The existing software program had developed serious flaws and went off line in June of 2001, expediting an urgent acquisition and integration project. The negative impact of the implementation was anticipated to be short lived and dissipating as the learning curve of this “user friendly software” was crested. It was assumed that this learning curve would be accomplished in approximately six months. The extent of the program capacity and complexity have caused the learning curve to extend a full year with the potential for several more months of acclimation anticipated.

While the impact of September 11, 2001 was unanticipated in the truest sense of that word, the impact of the electronic reporting system was unanticipated largely due to lack of experience, poor planning and optimistic assumptions. The impact of this contemporaneous project has played a strong role in the challenges associated with the realignment program and it has been reflected, as a source of conflict, in various areas of informal communications over the past months.

A third and anticipated factor was the implementation of billing for Fire Division EMS services as also initiated concurrently with the realignment. This process had been hotly debated in the Labor/ Management arena for several years with final broad based support of the concept generally tied to assurances that resulting funds would directly support Fire Division efforts to maintain/expand service delivery capacity. This process itself was also influenced by the events of September 11, 2001; improving the political and community "palatability" of supporting improvements to the local Fire Division through insurance supported user fees as opposed to additional tax based funding initiatives.

The SFRD is currently undergoing a significant structural and ideological change and lacks a meaningful mechanism to identify the impact of that change on the members and the leadership. While pre-implementation planning processes anticipated the need to evaluate specific input and output measures of system performance, no consideration was given to the need for evaluation of the organization's cultural response to the change. When confronted with anecdotal reports of plummeting morale, increased stress and other negative cultural indicators in the face of a difficult but apparently successful system transition, the SFRD required a mechanism to perform an internal environmental scan assessing the nature and potential implications of these responses to the change.

This research project is proposed to identify and describe perceptual characterizations of the current service model and implementation process. That information is intended to inform decision making in the short term with regard to areas worthy of more specific evaluation and potential adjustments to the process. It is further

proposed as an attempt to build appreciation for and capacity within, the organization for future planning, decision making and program implementation or evaluation needs.

This research project corresponds to enabling objectives of the Executive Development curriculum, specifically, Unit 7 Organizational Culture, objective 5 – regarding the leader's ability to further assess and analyze the organization's culture and climate (USFA Executive Development, 2002, p. SM 7-2).

To the extent that the results of this research process inform and develop fire service organizational capacity for implementing and reinforcing successful service strategies, it contributes to the operational objectives of the United States Fire Administration (USFA). Specific application is noted through promoting "within communities a comprehensive, multi-hazard risk reduction plan led by the fire service organization"(USFA Executive Fire Officer Program, 2002, p. II-2).

LITERATURE REVIEW

Qualitative Research

Qualitative research presents an opportunity to identify and describe concepts, characteristics, symbols and metaphors (Berg, 2001). What quantitative research benefits us through probability, predictability and generalizability, it loses in addressing meaning through social interaction. How a situation is defined determines the nature and meaning of actions within that setting. Qualitative research provides a means of accessing unquantifiable facts about the understandings and perceptions of people (Berg, 2001). Moreover, a qualitative approach is most desirable in research of an exploratory nature as it generates new understandings, allows the expression of strong opinions and incorporates estimations of behavior (Salant & Dillman, 1994).

Concept Mapping

Concept Mapping involves the assignment of quantitative value to qualitative data. Specifically, concept mapping describes social reality by structuring complex and diverse individual perspectives into a coherent and interrelated framework presented visually in the form of a cluster map (Pammer et al., 2001). Concept maps rely on data mining and visualization methods to build a structure of what is known about the relationships within a context of meaning. In this way they assist in identifying what is known, revealing what is not understood and integrating new information into a comprehensive system (Schuster, 2002; Thearling et al., 2002).

Data mining provides a systematic means of qualitatively reviewing complex data sets and identifying useful relationships that may not have been intuitive (Fayyad & Grinstein, 2002; Thearling et al., 2002; Grinstein & Ward, 2002). The task of data mining is to cluster data into distributions through which we are then able to identify, understand and summarize homogenous sub-populations (Fayyad & Grinstein, 2002, p. 5). While cluster analysis originated in the 1930's in social sciences, it added value to the biological sciences beginning in the 1960's and it's use has been accelerated by the development of computer technology (Julnes,1999).

The level of measurement for data collected can include nominal, ordinal or interval (Cox & Cox, 2001). The value of data visualization through cluster analysis is not in finite measurement but rather in comprehension through context (Thearling et al., 2002; Grinstein & Ward, 2002). Context involves the reduction of complexity into categories which demonstrate overall measures of similarity or dissimilarity displayed as small distance variations within a cluster relative to large distance variations between

clusters (Julnes, 1999). This process of displaying objects, relationships or attributes as points in space is also referred to as multi-dimensional scaling (Cox & Cox, 2001, p. 1).

Cluster analysis is typically an exploratory approach to data which do not have labels, with the focus of the analysis intent on identify groupings which can then be developed for further study (Lawson & Denison, 2002; Schuster, 2002). While these spatial patterns are represented by a bounded region, their pattern of interest or impact is often considered to extend outside that space (Van Lieshout & Baddeley, 2002)

Organizational Change

To most of us, it may seem a truism that no manager, leader or employee for that matter, can talk about their organization today without referring to some issue involving the necessity, rate, dimension or quality of change. It is suggested that most managerial attempts to significantly change an organization are unsuccessful (Burke, 2002). Further, the most frequently cited reason for failures of organizations in a state of change, is attributed to “a neglect of the organization’s culture” (Cameron & Quinn, 1999, p. 1).

Discussions on the nature of change frequently include the concept of resistance to change, as a negative attribute. While Burke (2002, p. 93) proposes that resistance stems from fear or intolerance, loss of something of value or a belief that the effort is doomed, he also suggests that apathy is of considerably greater concern. Sources of resistance have elsewhere been attributed to the lack of internal organizational capacity and the level of credibility or uncertainty surrounding the changes (Gabris, 1999). Others have taken a more positive approach to the concept supporting a view that resistance to change provides an opportunity for directly observable data with which one can evaluate the progress of learning within the given environment (Argyris, 1999).

Organizational change at its most basic level can be divided into two frames, transformational/revolutionary or transactional/evolutionary (Burke, 2002, p. 12). The primary differential determinant is the length of time required for a given level, or order of change. Orders of change are typically expressed in terms of the breadth of impact across functional aspects of an organization. For example, a first order change would impact a subsystem; second order, a set of subsystems; third order, an organizational process or outcome (Burke, 2002, p. 105). The higher the order and the shorter the time frame, the more transformational the change. The descriptor "business process reengineering" has seen much recent use as an expression of transformational change within organizations (Drejer, 2002, p. 42).

Organizational Culture

The power of a strong and unique culture within an organization is its ability to reduce uncertainty through creating identity, motivation and commitment (Cameron & Quinn, 1999). When organizational decisions are intended to generate change actions they must likewise include motivation and commitment as well as cognition, to stimulate the desired response (Brunsson, 2000) By logical extension, an organization's ability to stimulate successful change action, would then be directly linked to the alignment of the desired actions with the existence of a supportive culture. The problem inherent in this situation is that the true organizational culture, while typically pervasive, is not always overt, not easily identified or described and typically taken for granted (Cameron & Quinn, 1999). Janis (2001) has identified the restrictions placed on critical thinking as the result of strongly developed group norms, which in turn leads to concurrence-seeking within the group. While managers and leaders planning for change assume a linear

progression, the results are typically nonlinear (Burke, 2002). It is also noted that cultural elements within the organization may be at cross purposes with the desired actions and where they attain dominance, will alter those actions in fact, if not officially (Hutchinson, 2000).

PROCEDURES

For the purposes of this qualitative study, no preliminary interviews were conducted with any of the participants specific to the study. The study population is initially limited to a maximum of twelve participants based upon the need to keep the list of generated statements to be reviewed by each participant below seventy-five total. It is expected that each participant will generate from three to six statements in response to the questionnaire.

Participants were selected as a non-probability, purposive sampling of the total organization population of 127 members (Berg, 2001, p. 32). Selection was made by position status both in whole and in a representative fashion within the organization population. Further, participation reflected a large element of the management team previously described. Eleven participants were initially selected from administration, field staff and union representatives. They included the Assistant City Manger, Fire Chief, Assistant Fire Chief and the three Battalion Chiefs, the Union President (Firefighter/Paramedic), one Captain, two Lieutenants (one a member of the union contract negotiating team) and one Firefighter/Paramedic. Of the eleven initial participants, only nine fully completed all aspects of the study. The two participants not completing the study were from the administrative candidate group. The final

participant group then reflected four administrative staff and five field staff/union officers. Of these nine, six were actively involved in the management team described.

Participants were provided with a preprinted Statement and Response Sheet (Appendix A). The written instruction was to "Generate at least three statements (short phrases or sentences) that describe the Fire Division service realignment as implemented January 1, 2002". Participants were verbally instructed that the statements could reflect a global, local or personal perspective and could be objective or subjective in nature. Participants were asked to refrain from blanket generalizations of a positive or negative nature i.e. "it's great" or "it's terrible".

A total of 54 statements were generated with all participants completing the process generating at least three statements (average of six per person). Once the completed statements were collected, they were randomized and listed as numbered statements on the statement rating sheet (Appendixes B and C). The rating sheet was then distributed to participants with an accompanying Sorting Sheet (Appendix D). Participants were advised to read and rate the statements using a 4 point, Likert-style rating scale with regard to the importance to the Fire Division's operations and the feasibility of acting on the statement to improve the success of those operations. The final activity requested of the participants was to review the complete list of statements and using the Sorting Sheet (Appendix D), form groups of related statements. Grouping rules required there to be less than n (n=54) groups and more than one group. No specific criteria were identified for sorting beyond the participant's perception of relatedness. Participants were advised that naming/labeling the groups was not required but could be performed if so desired for convenience in the sorting process.

The data collected were combined in a total similarities matrix using SPSS, Inc. Version 11 software. The data was analyzed using multivariate hierarchical cluster analysis (SPSS, 1999, p.293). This technique groups the responses based upon the frequency that any two statements are paired (found to be similar or related) by the participants and then again paired with each additional statement until all statements are included in one large grouping or cluster. The resulting model depicted those identified pairing relationships as a multi-dimensional scaling (MDS) scatter plot based upon the squared Euclidean distance as well as a hierarchically scaled dendrogram (SPSS, 1999, p. 293-294). Significant sub-groups of clusters were then drawn as polygons reflecting the physical boundaries of the statement distribution.

The next step in the Concept Mapping process involved demonstrating the Importance and Feasibility scaling of each cluster polygon through dimensional layering. Dimensional layering involved “response scaling” (Salant & Dillman, 1994, p. 88) or visually representing the measure of central tendency in responses to importance and feasibility. This measure reflected the mean (mode where indicated) value of the participant’s importance or feasibility ratings over all individual statements included within a given cluster polygon. The higher the mean value of importance or feasibility attached to a given cluster polygon, the more layers (height) attached to that cluster polygon.

The final Concept Maps produced a multi-dimensional depiction of thematically and physically identified cluster polygons, of specific size (density of clustered statements), of specific distance from the central axis (least distance equaling highest similarity) and of specific height (by importance or feasibility).

RESULTS

Interpretation of the Concept Map

Results of the Concept Mapping are displayed in Appendixes E and F. The five identified Clusters were grouped into thematic categories reflecting various benefits or challenges inherent in the realignment of operational units effected January 1, 2002.

The following is a brief listing of the five identified clusters with summary explanatory content information.

Role expectations and challenges.

The principle concepts included in this cluster are identified, as (a) an increase in the expected workload, (b) combined (i.e. increased) responsibilities in limited work hours as available, and (c) the primary focus on EMS response role impacts traditional treatment of new hires, senior personnel, training, inspections and other routine tasks.

This cluster includes statements which identify an appreciation for a change in type of work expected (more administrative) as well as perceived quantity. While the realignment itself did not change the quantity of specific work tasks performed, nor the total number of personnel performing those tasks, it did increase the number of officers responsible for those tasks (increased supervision responsibility) while reducing the number of functional units (companies) performing those tasks. Also, the simultaneous implementation of improved computerized data reporting systems, which automatically establish expected reporting requirements (minimum data Quality Assurance parameters) and edit reports as they are generated, has increased both the capacity for, and the sense of oversight associated with departmental documentation. This has been repeatedly

expressed as an increase in expected workload and task time in a variety of organizational forums.

Finally within this cluster are statements, which reflect a concern about the impact of these new roles on the holistic development of new hires and the level of appreciation for existing (more senior) personnel without specialized EMS skills. These statements relate directly to the inherent desire to socialize new entrants to a specific group norm. As members perceive that the norm is being changed, it clearly represents a threat to their sense of position (power: expertise, relationship/access, etc.) within the organization. This cluster receives a moderate Importance rating with a reduced Feasibility rating. The implication may be that while the process and challenge of role change is recognized as central to the organizational mission and this particular program implementation, there is a quality of fatalistic acceptance associated with this issue.

Positive move benefits.

The principle concepts included in this cluster are identified, as (a) a first step toward a new paradigm, (b) improved overall service availability, and (c) a broadened managerial/administrative role of mid level officers.

This cluster of statements addresses most closely the positive aspects of a proactive approach to the organization's current position and opportunities, the move to a new paradigm. Its central position in the map also indicates general concurrence on the value of taking proactive steps. Many of the statements reflect effective distribution of workload and additional promotional opportunities, which in turn represent an effective distribution of supervisory responsibility. Under the current program the effective span of control is universalized for any one officer at any level as generally three subordinate

officers or personnel. While identifying diversification of supervisory responsibility, the statements also acknowledge that an increased focus on the administrative responsibilities of mid level officers is seen as a direct result of the program.

The Importance and Feasibility rating of this cluster was consistent at the moderate level on both counts. The moderate mean values combined with the centrality of the cluster indicate a positive value placed on both the "process" and on acting on improving through this process.

Improved use of limited resources.

The principle concepts included in this cluster are identified, as (a) a clear improvement in EMS service delivery capacity and efficiency, (b) more efficient staffing on all units universally benefits company operations, and (c) it establishes capacity for expansion of service requests.

The statements in this cluster tend to confirm the specific benefits of increased capacity through addition of EMS response units, staffing per all units, ability to handle higher demand load and improved ability to deliver ALS care. These statements generally refer to greater efficiency through reduced extra unit/personnel responses, reduced out of service times for secondary units and generally positions the organization for expanded service demands. While this cluster is similarly positioned on the lateral midline, it is more removed from the absolute center. This physical position supports an interpretation, which recognizes these as core components of one specific aspect of the organizational profile; functionally related but less critical in a meaning sense. The assignment of moderate Importance and Feasibility to this cluster similarly reflects an assignment of benefit to acknowledging and working on and through this process.

Concerns regarding the weighting of benefits and costs in decisions.

The principle concepts included in this cluster are identified, as (a) the radical changes are without sufficient present justification, (b) the improved EMS response comes at a cost to fire service capacity, and (c) a lack of cross-representational input into decision making process.

The responses grouped in this cluster tend to identify direct disagreement with portions of, or the process as a whole. While some statements acknowledge a benefit to the EMS service delivery process, they identify those benefits as accomplished at a significant cost to firefighting capacity and competency. The statements describe a lack of relationship between this program and the real issues facing the organization, a lack of true justification for initiating the program and concerns that the implementation preceded procurement of necessary equipment and development of necessary facilities. Finally, this cluster seems to call into question the true level of participation of the members of the management team collected to derive and develop the program.

The Importance mean for this cluster was again at a moderate level indicating that these issues deserve attention, not necessarily through agreement, but at least through attempts to address and establish the credibility of the process throughout the membership. The Feasibility layering for this cluster received the lowest rating of any cluster, seemingly in support of the interpretation that acting on the specific disagreements is not promoted but rather addressing or correcting the perceptions which lead to the disagreement.

Erosion of personnel identification with organization.

The principle concepts included in this cluster are identified, as (a) a perceived decline in morale across membership, (b) a negative personnel impact transferring to customer satisfaction, and (c) a desire to see the morale issue given higher priority.

This final cluster represents the most subjective response list. The word morale appears in all but one of these statements. In turn the indicator of morale is tied in various statements to predicted impacts on customer satisfaction, employee health and burn-out. The word "ignored" appears in this list of statements as well. The general impression here is one of disenfranchised personnel. The outlier position of this cluster indicates that there was less universal agreement on the grouping of these statements. The Importance layering of five (the highest given with a median value of 3.5 out of 4) is indicative of five very strong responses accorded by those representing the statements with low to moderate agreement on the part of the remaining participants. The Feasibility layering of this cluster falls back into the moderate range without such marked bilateral disagreement between individual ratings.

DISCUSSION

In the initial phase of the strategic planning process, the primary goal was to position the Fire Division such that when unique demands for services were made, a system would be in place to provide an all hazard unit of service to a given population and area. The desired end was to preclude the destructive and costly debate about which primary service the population or area might need the most, EMS or Fire. Development of combination capacity companies allowed for immediate location of a self-sufficient unit of service upon which to base the larger organizational service model. The model further expanded the Division's capacity to relocate units of service within existing

boundaries based upon demand experience and response time coverage needs. The Concept Map indicates some areas of correlation with that plan along with some noted areas of divergence.

The general presentation of the thematic clusters on the Concept Map follows a linear locus from left to right along the midline with two vertical outliers to the left of center. The most central clusters identify a classic paradox between the benefits of proactive planning and challenges inherent in the nature of changing roles and expectations. The implication being that while the value of the Division's indicated goals were appreciated by many of the respondents, the stress experienced in the realignment process resulted from a fundamental altering of the way individuals had to think about their work and the way they solved problems (Cameron & Quinn, 1999).

The fact that the Division was not forced into this process but rather chose to undergo the changes in anticipation, heightened the uncertainty. It is commonly reported that the time to investigate alternatives and to plan for change is when things are going well. This is alternately referred to as the paradox of change or the paradox of success (Burke, 2002; Handy, 2002). The Division's initial planning and preparation for the change rationally assumed linear frames and responses because this action was identified as proactive and thus lacking a crisis source for unanticipated reaction. It should also be noted that the breadth and pace of the realignment, associated with the other changes occurring simultaneously, easily identified this as a third order change (Burke, 2002), and least likely to proceed in such a linear fashion.

As stated earlier, planning through a linear process to the point of a major decision and then assuming a linear path of progress thereafter based solely on cognitive

consensus is unlikely to produce the desired results. While Janis (2001) counsels for challenge and evaluation of ideas and solutions outside of ideological positions, Brunsson (2000) advises, that creating a strong ideological base or sense of meaning, within the organization is essential to effective change and can cut short or eliminate much of the decision paralysis as the participants find it much easier to agree and then to act. While it appears that the participants of this study acknowledged the attainment of some predicted benefits from the realignment, they did so reluctantly. The difficulty noted is balancing support of critical evaluation and honest communication with solidarity of meaning for the group.

Senge (2000) says that change begins with the passionate few. While some of the statements clearly attached a positive value to the proactive approach, there was not consensus on the part of all participants and to that extent, resistance (in fact, some passionate resistance) to the realignment program existed. The diversity and intensity of statements further suggests that resistance exists and is expressed proportionately to the level a given individual felt they had any choice in, or agreement with the decision process (Burke, 2002). Finally, abiding by the decision to move forward represented a level of commitment from the members but not necessarily motivation. Thus resistance increases should have been expected when additional modifications such as compounded changes to reporting requirements or the administrative work processes were required (Brunsson, 2000).

The horizontal trend line of the Concept Map continues through the cluster entitled *Benefits through improved use of limited resources*. Various objectives of the realignment program are being met and the 5 year personnel, equipment and facilities

plan as presented at the culmination of the planning phase is moving into the second year and on task with improvements as projected. The present conflict based counter theme counsels for abandoning the course or significantly altering the course in favor of moderating options. Managing that conflict element through this current phase will benefit from making those projected milestone accomplishments visibly clear steps toward an identified goal. Moreover, Kotter (2003) suggests that successful change relies on more than identifying those milestone accomplishments, it relies on presenting them in an emotionally compelling manner.

The map also displays two clusters in the extreme left upper and lower regions. These cluster themes challenge the realignment program in terms of specific benefit/cost analyses and ultimately the perceived impact on employee identification with the program and investment in the organization as a whole. These last two clusters are physical and philosophical extensions of the adjacent central cluster identifying the challenge of changing roles and expectations. Gabris (1999) refers to this form of resistance as “credibility anxiety” or the state of uncertainty that surrounds the change. In a thematic sense, the map visually demonstrates that realignment applies both technically to the placement and deployment of physical resource assets as well as to the personnel and their relationship to sense of role, function and future in the organization. The concerns noted in statements regarding the impact on traditional roles and identities further confirm Brunsson’s (2000) assertion that ideological inconsistencies within an organization obstruct change, reduce alternatives and contribute to reinforced positioning.

RECOMMENDATIONS

Incorporate the whole of the organization in informing the decision making and communication process for any significant change action.

Initial conflict management strategy would have attempted to incorporate maximum cross-rank and cross-organizational boundary participation in the strategic planning process. Future attempts to overcome the inertia and complacency of the moment would benefit from mechanisms to involve more of the members in the process through surprise, active inclusion and ideological grounding.

If members could not be involved directly in work groups, then the means to participate as recognized stakeholders; recipients and feedback agents for regular communication on the progress of the process should be devised. The existing process was largely confined to rank regulated participation and chain-of-command distribution of information. The justification for that decision held some merit as an attempt to incorporate as completely as possible, a specific group of personnel in a central role; to direct the flow of information, position and power through them.

Focus change action based upon meaning to build a supportive Ideological base.

The cost of the decision to limit participation to administrative officers regardless of their interest, appeared as a significant breakdown in the consensus process when the members were not at the table. Once individual members were outside of the bounded group, commitment to support without the meaning attachment, contributed to the perception that participation was not reflective of representation in the decision making process. Further, as mentioned earlier, commitment did not directly correlate to motivation. As such, reliance on those committed members to provide expanded

motivation to the Division as a whole proved to be a significant point of weakness in the process. At the outset of the change process, the team desired many perspectives to develop solutions. Implementing the selected solution however requires a different capacity. Future consideration will have to be given to assessing and balancing ideological alignment with multiple perspectives as a primary component of the development of a change team.

Establish clearly communicated goals and objectives.

There is a clear message communicated in the two outlier cluster statement groups. It is that the very foremost goal (the desired meaning) of the process is not well communicated and therefore not shared. There is further an absence of clarity on the prioritization of objectives and strategies. This failure supports an individual's right to call any particular objective or strategy into question as a priority objective and thus invalidate the entire program.

It is noted that no official documentation of the process included a specific listing of goals. Some indication of specific objectives was noted in minutes of the meetings. Conflict management strategy would have included materializing the goals before moving to objectives. This would be consistent with establishing meaning for the group involved as well as the organization as a whole. The development of objectives and identified strategies would then follow in written form as an underpinning for each goal. A conflict management strategy would have included universal distribution of those understandings for all members to review, discuss, base decisions on and most importantly, track progress toward.

Identify and address the counter culture present.

While attempting to address issues of inclusion now may appear at first blush to be too little and too late, it should be understood that this strategic planning process is still underway and once again, now is the best time to enter and redirect the rest of the ongoing process. Acknowledging such, the Division will need to identify means with which to include all members in the process at some level, most specifically ideologically. A first step might be to begin the incorporation process as a facilitated open forum and feedback process. Such a venture however would require respected and effective facilitation to support the stakeholder development process as opposed to presenting a platform from which to simply vote out the current program. Other recognized feedback tools such as additional studies or surveys, with published summaries and responses, would serve to open communications across the organization. To date, there has been no formal effort to broadly publish information communicating input and output statistics or progress assessment in support of objectives, goal attainment and meaning fulfillment. Regular distribution of such information is easily accomplished through newsletters, regularly posted reports, posters and email. The Division should identify formal and informal channels through which to regularly accomplish distribution of this information to all members.

The first of the annexations tied to a Community Economic Development Agreement process, have now been initiated. The projected development in at least two of those areas will place direct burdens on the Division within the next two years. While many of the respondent's statements suggested no current justification for the realignment to proceed in advance of the demand, it is clear that the message should be:

attending to these issues now will ensure that when the demand is presented, many difficult hurdles may be well behind the organization. Perhaps the most important finding could be that the members of the Springfield Fire Division would appreciate the development of skills and capacities for addressing change based conflict, with a tried management process.

Limitations of this project

The author must indicate the obvious, which is proximity to the issue as an administrative member of the Springfield Fire Rescue Division. While specific interviews were not conducted for this study, much history and opportunity for participant observation has been afforded the author over the past three years. While these elements are not inimical to a qualitative study format, inherent in such proximity to the issue is the potential for observer bias. Future studies conducted by the Springfield Fire Rescue Division for the purposes of organizational development should incorporate objective agents to endeavor to maximize validation of the results.

The author must also indicate that this study is the first foray into the Concept Mapping process. As such, several factors were realized by the author once the study was underway. The initial statement guideline utilized was too nebulous. The guideline might have more effectively requested statements as active descriptions of the specific progress toward or relationship to Springfield Fire Division mission or goals. Many participants reported confusion and felt the need to respond with lengthy descriptions of their statements, some including as many as 4 written pages. Participants further reported being most frustrated, when trying to rate the feasibility of an impression statement.

It may have also been beneficial to perform a concurrent survey across the larger employee group to attempt to determine the level of agreement on (that is to say understanding of) the Fire Division mission and goals. Interpreting the results of the Concept Map could have benefited from reflection against broader based, objective survey data.

References

Argyris, C. (1999). Initiating change that perseveres. In R. C. Kearney & E. M. Berman (Eds.), *Public sector performance: Management, motivation and measurement* (pp. 57-64). Colorado; Westview Press.

Berg, B. L., (2001). Qualitative research methods for the social sciences. Boston; Allyn and Bacon.

Burke, W. W. (2002). Organization change: Theory and practice. London; SAGE publications.

Brunsson, N. (2000). The irrational organization: Irrationality as a basis for organizational action and change. Bergen: Fagbokforlaget.

Cameron, K. S., & Quinn, R. E. (1999). Diagnosing and changing organizational culture: Based on the competing values framework. New York; Addison-Wesley Longman, Inc.

Cox, T. F., & Cox, M. A. (2001). Multidimensional scaling (2nd ed.). New York; Chapman & Hall/CRC.

Drejer, A. (2002). Strategic management and core competencies. Westport, CT; Quorum Books.

Fayyad, U. & Grinstein, G. G. (2002). Brief History of related fields. In U. Fayyad, G. G. Grinstein & A. Wierse (Eds.), *Information visualization in data mining and knowledge discovery* (pp. 1-17). New York; Morgan Kaufmann Publishers.

Gabris, G. T. (1999). Recognizing management technique dysfunctions: how management tools often create more problems than they solve. In R. C. Kearney

& E. M. Berman (Eds.), *Public sector performance: Management, motivation and measurement* (pp. 101-118). Colorado; Westview Press.

Grinstein, G. G., & Ward, M. O. (2002). Introduction to data visualization. In U. Fayyad, G. G. Grinstein & A. Wierse (Eds.), *Information visualization in data mining and knowledge discovery* (pp. 21-46). New York; Morgan Kaufmann Publishers.

Handy, C. (2002). Elephants and fleas: Is your organization prepared for change. *Leader to Leader, 24,* 29-33.

Hutchinson, W. (2000). Bottom-up management and system design. In S. Clarke, & B. Lehaney (Eds.), *Human centered methods in information systems: Current research and practice* (pp. 61-75) Hershey, PA; Idea Group Publishing.

Janis, I. (2001). Groupthink: The desperate drive for consensus at any cost. In J. M. Shafritz & J. S. Ott (Eds.), *Classics of organization theory, 5th ed.* (pp. 185-192). New York; Harcourt Publishers.

Julnes, G. (1999). Principal component analysis, factor analysis and cluster analysis. In G. J. Miller & M. L. Whicker (Eds.), *Handbook of research methods in public administration* (pp. 549-598). New York; Maarcel Dekker, Inc.

Kotter, J. P. (2003). The power of feelings. *Leader to Leader, 27,* 25-31.

Lawson, A. B., & Denison, D. G. (2002). Spatial cluster modeling, an overview. In A. B. Lawson & D. G. Denison (Eds.), *Spatial cluster modeling* (pp.1-19). New York; Chapman & Hall/CRC.

Pammer, W., Haney, M., Wood, B., Brooks, R., Morse, K., Hicks, P., et al. (2001). Use of telehealth technology to extend child protection team services. *Pediatrics, 108,* 584-590.

Salant, P., & Dillman, D. (1994). How to conduct your own survey. New York; John Wiley and Sons.

Schuster, P. M. (2002). Concept mapping: A critical-thinking approach to care planning. Philadephia; F.A. Davis Company

Senge, P. M. (2000). Lessons for change leaders. *Leader to Leader*, *18*, 21-27.

SPSS base 9.0 applications guide. (1999). Chicago; SPSS, Inc.

Thearling, K., Becker, B., DeCoste, D., Mawby, W. D., Pilote, M., & Sommerfield, D. (2002). Visualizing data mining methods. In U. Fayyad, G. G. Grinstein & A. Wierse (Eds.), *Information visualization in data mining and knowledge discovery* (pp. 205-222). New York; Morgan Kaufmann Publishers.

U.S. Fire Administration National Fire Academy. (2002). *Executive Fire Officer Program, Operational policies and procedures, applied research guidelines.* Emmitsburg, Maryland: Author.

U.S. Fire Administration National Fire Academy. (2002). *Executive Development: Student Manual.* Emmitsburg, Maryland: Author.

Van Lieshout, M. N., & Baddeley, A. J.(2002). Extrapolating and Interpolating spatial patterns. In A. B. Lawson & D. G. Denison (Eds.), *Spatial cluster modeling* (pp. 61-86). New York; Chapman & Hall/CRC.

Appendix A

Statement and Response Sheet

Name:

Generate at least three statements (short phrases or sentences) that describe the Fire Division service realignment as implemented January 1, 2002.

1.

2.

3.

4.

5.

6.

APPENDIX B

8-Nov-02
Fire Division Realignment study by Nick Heimlich

Please review each statement and rate both its importance to the success of the Fire Divisions operations and the feasibility of acting on the statement, with respect to the realignment discussed.
Please use an indicator of 1 through 4 to rank each statement in importance and feasibility .
1 =No or very low importance or feasibility
2= Somewhat Important/Feasible
3= Of moderate importance or feasibility
4= Critically important or highly feasibile

Imp.	Feas.	No.	Statement List
		1	Addressed several issues of importance to the Fire Division
		2	Increase to 5 ambulance units decreased response times and increased service capabilities
		3	Eliminated need to use larger, more expensive equipment in EMS operations and resolve confusion of public regarding same
		4	Radical changes made to Div. structure and running code without addressing "obvious" problems with dispatching system and that impact on appropriate levels of service
		5	Overall improvement in EMS delivery due to availability of more medic units
		6	Resulted in an increase in the "expected" work load
		7	Combos appear to have addressed EMS response and dispatch problems at the expense of firefighting and training.
		8	Will result in decrease of customer satisfaction corresponding to decrease in employee moral and job satisfaction
		9	Potential increase cost to City from low morale/ elevated stress resulting in increased sick leave, insurance use, burn out
		10	More available units of service than prior to realignment
		11	increase staffing assignment to units has benefited operations
		12	Hours spent by Lt.s doing EMS may reduce the experience levels of officers promoting to Capt. And Command Officer positions.
		13	Stabilized Div. ability to respond to multiple EMS calls without moving into crisis mode while maintaining adequate fire coverage
		14	Implementation/adjustment of this realignment has not been handled well.
		15	Brought number of people assigned to response duties (fire v. ems) in line with response experience
		16	Represents "first step" in moving Division to new paradigm of optimal use: assets, talents,equipment & personnel
		17	Resulted in a broader distribution of workload among personnel: welcomed by some, not by others
		18	Plan was determined prior to discussions with Captains or union and resulting discussion was illusion devised to shift blame if necessary
		19	Increased risk management issues involving fire related encidents
		20	Prior to implementation, didn't realize how much of dept. workload/daily duties were done by engine/truck companines.
		21	Combos have caused new recruits to ride medic units from day one and to attend paramedic classes while assigned to combo units
		22	The total service that is available at any given time to the customer is decreased due to the other half of the "combo" apparatus being out of service.
		23	Decrease in quick response of fire companies due to station location, enhanced combo availability vs. lack of dedicated fire

APPENDIX C

24 units in south and southeast areas.
25 More administrative workload than before the realignment
26 More efficient use of personnel: reduced out of service times for multiple apparatus
27 Perception that the organization is abandoning more senior personnel whose needs and goals do not serve the organization's needs to improve efficiency of the EMS system.
28 Positions Div for future expansion of service area and increases in demand for service from existing service area
29 The realignment has caused a decline in moral on the department.
30 Improved quality of ALS treatment while reducing extra unit responses and transport delays
31 Enabled increased efficiency and effectiveness, enhanced service ability
32 Has not reduced response times resulting in "question" as to appropriateness of entire plan
33 Ignored the issue of employee moral and job satisfaction and clearly showed these issues are not priorities
34 Current plan may "work" but is not responsive to citizen's or personnel needs
35 Use of Combo units tends to keep you in your own district
36 Combos have addressed EMS workload well but uncertain if because of delivery concept or just increase of inservice medic units
37 Decrease in morale since the realignment
38 More EMS units available to handle increase in medical calls
39 Allowed for and provided additional promotional opportunities for Div personnel
40 Burnout will be a significant problem in the future
41 Proven significant reduction in service costs due to reduced mileage and wear on larger apparatus
42 Combining expanded EMS service with EMS billing softened impact of adding fees - appreciable benefit to fee for service
43 Original objective to create new companies, "movable" in response to CEDA demands no longer valid
44 Negatively impacts effectiveness and efficiency of companies to perform work assigned due to increased responsibilities and limited work hours available
45 Restructuring was ill conceived and withour merit to real issues facing Fire Div.
46 Decreased moral, becoming "just a job"
47 Plan was put in place too soon; before necessary equipment and facilities were in place
48 Negative effects of combo units are greately increased when a combo unit is at a station by itself (I.e. Co. 6 at Sta.6)
49 Increased stress on personnel due to lack of rotation to dedicated fire apparatus; will lead to increased health problems
50 Provides better Fire and EMS service for the city
51 Mutual aid (use) has decreased as a result of the realignment
52 Resulted in decreased time and opportunity to train personnel, perform inspections and do routine daily tasks
53 Effective redistribution of response load over broader segment of on duty personnel, reducing EMS responses per employee
54 Broadened the managerial/administrative role of the rank of Captain within the Div,
55 Computer reporting has magnified the burnout and moral issues.
blame if necessary

Appendix D

Sorting Sheet

Please review the statements and place the statements, using their numbers, into groups that make sense to you. You may create as many groups as you like. You may also name the groups if that helps you perform the grouping task.

GROUP 1:

____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____

GROUP 2:

____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____

GROUP 3:

____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____

GROUP 4:

____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____

GROUP 5:

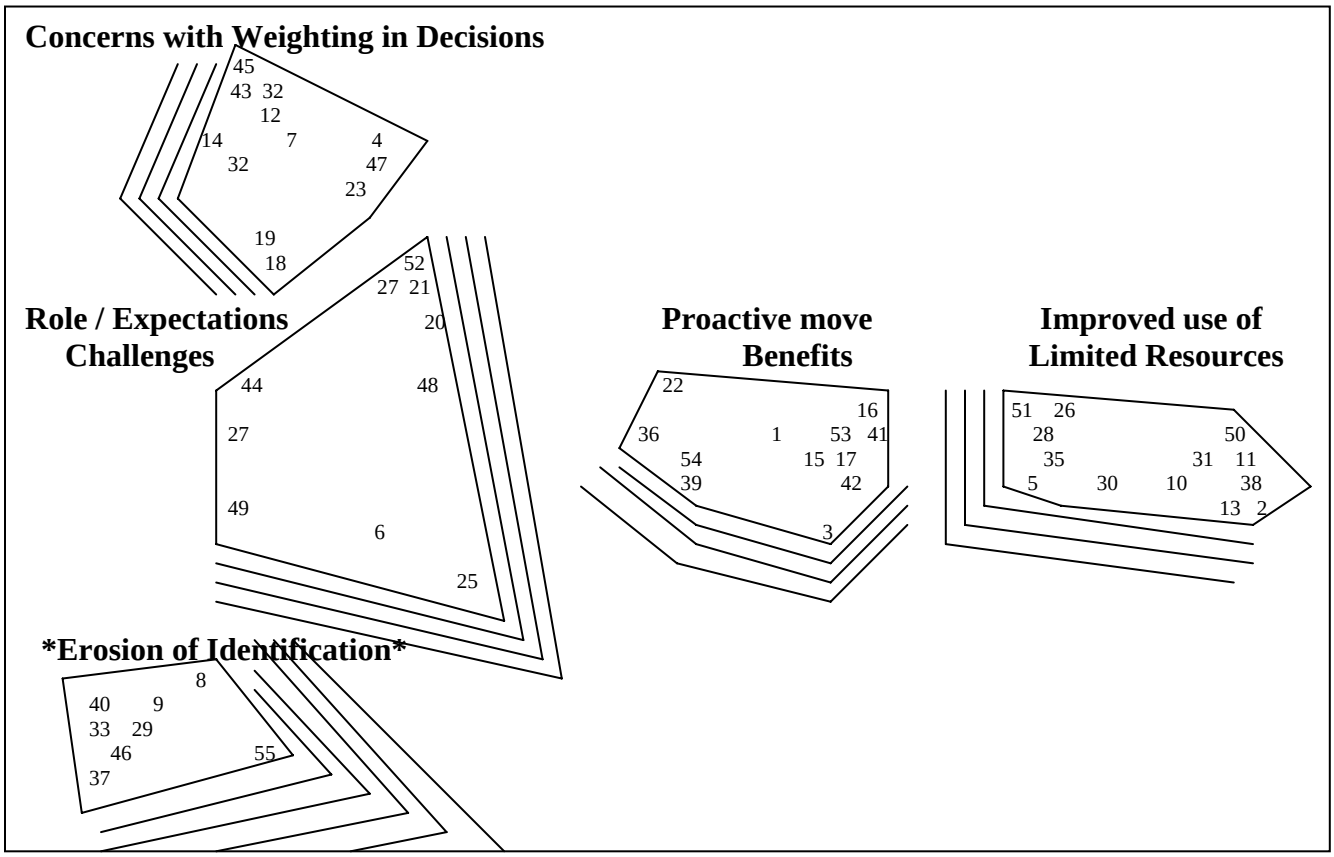
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____ ____ ____

Appendix E

Springfield Fire Division Realignment

Group Cluster Rating Map

Importance Layering



Height = average Importance of the cluster in meeting the goals of the realignment

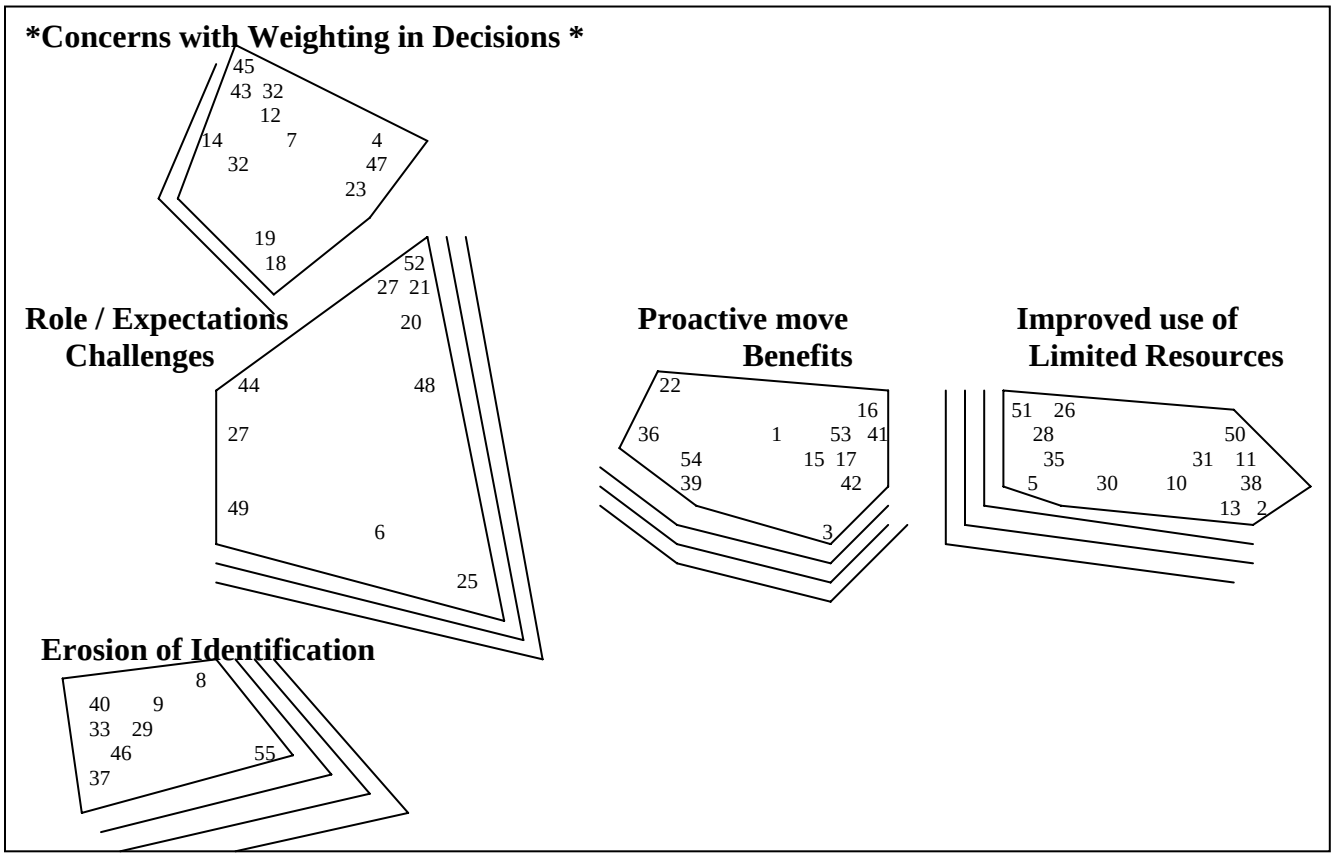
Layer	Mean(*Median*)
1	1.5 – 1.99
2	2.0 – 2.49
3	2.5 – 2.99
4	3.0 – 3.49
5	3.5 +

Appendix F

Springfield Fire Division Realignment

Group Cluster Rating Map

Feasibility Layering



Height = average Feasibility of acting on the cluster in meeting the goals of the realignment

Layer	Mean(*Median*)
1	1.5 – 1.99
2	2.0 – 2.49
3	2.5 – 2.99
4	3.0 – 3.49
5	3.5 +