Creating High Reliability Organizations Using Mindfulness

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Abstract

High Reliability Organizations (HROs) are organizations that maintain processes with extremely low failure rates where the costs of failures are extremely high. According to Weick, et al. (2008) key aspects of HROs are: preoccupation with failure, reluctance to simplify, sensitivity to operations, among others. While we understand What the aspects of HROs are, we lack the understanding of How to implement HROs and Why they work. Using a Soft Research Methods approach with Mindfulness techniques, this study demonstrates implementation of HRO principles in Healthcare. In doing so, this research finds that Mindfulness techniques used with Soft Systems Methods provide an effective framework to create HROs.

Keywords: High Reliability Organizations, Mindfulness, Soft Systems Methods, Healthcare Operations Management
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1.0 Introduction

High Reliability Organizations (HROs) refer to organizations that typically operate in hazardous environments where the consequences of process failures are extremely high (Baker, et al., 2006). They are very costly to develop and manage, and usually involve large technical systems like utilities, military institutions, healthcare, etc. Overtime however, HRO investment pays-off by preventing the high costs of process failure (Hales et al., 2012) which according to Deming (1986) are the highest costs of all and are often incalculable – often unknown and unknowable.

One recent example is the failed launch of the Affordable Healthcare Act website (HealthCare.Gov) in November 2013. Blamed on an incompetent contractor (CGI Group), and over-site failures of the U.S. Department of Health and Human Services (HHS), this single failure threatened to collapse the whole program which was promoted as a key accomplishment of U.S. President Barrack Obama. It also led to the resignation of the Secretary of the HHS Department in April 2014. Several researchers (e.g., Wieck, et al., 2008) have identified key aspects of HROs: (1) a preoccupation with failure, (2) a reluctance to simplify interpretations, (3) sensitivity to operations, (4) under-specification of structures, and (5) a commitment to resilience. Despite their demonstrated value, there is a paucity of management research on HROs, specifically on how they are created and why they work. In fact, Weick et al. (2008, p. 32) states that important features of HRO implementations still “remain unarticulated”. In short, while we understand what the aspects of HROs are, we lack the understanding of how to systematically create HROs and why they work to increase reliability.

The purpose of this research is to show how to systematically implement HROs using a Soft Research Methods approach moderated with Mindfulness techniques. Soft Research Methods are qualitative techniques appropriate when formal experimentation and quantification of the variables are difficult or impossible to conduct (Liu et al., 2012). The activities of Mindfulness fit into the Soft Research Methods framework because they are qualitative techniques as described by Chakravorty and Hales, (2013). This study describes an HRO implementation in a critical care unit of a regional healthcare organization in the United States that ultimately improves the reliability of patient care. In doing so, this research contributes in two ways. First,
for practitioners this research suggests how to create HRO organizations through systematic implementation of the HRO aspects using Mindfulness techniques to achieve high process reliability. Second, it answers the question of why the aspects work. This is important because developing and operating an HRO is challenging due to the extraordinary reliability demanded by its clients and the high costs involved in failing (LaPorte and Consolini, 1999; Hales et al., 2012). Second, for academicians, this study suggests many areas for future research. For example, failure impact studies are sparse in the management literature; however, they have been used extensively in engineering (e.g., Beer, et al., 2012).

In the next section, we provide a literature review of HRO aspects, Soft Research Methods, and Mindfulness techniques. In section three, we include a discussion of case study which provides details of data collection and analysis for implementing HROs. In section four, we delineate our implementation experience and, in section five, we provide results of the implementation. In section six, we provide implications of our implementation experience with direction for future research and finally, we write conclusions from this study.

2.0 Literature Review

2.1 Highly Reliability Organizations (HROs)

HROs focus on delivering high reliability outcomes to clients through very low failure rates (Issel, Michele, and Narasimha, 2007; Kaplan, 2002). Since reliability is a key dimension of quality (Garvin, 1987) greater reliability can lead to greater organizational competitiveness. Since most HRO studies are conducted in large technical systems, i.e. the Military, public utilities, and healthcare organizations, it has been assumed that these contexts benefit the most from HRO implementations. A few organizations that successfully compete on reliability demonstrate this (i.e. Schulamn, 1996), as well as those that incur huge costs due to process reliability failures. Even though several researchers have worked on HROs over the years (e.g., Seaman and Williams, 2012; Chassin and Loeb, 2011), Weick and Sutcliffe’s work is considered seminal (Weick et al., 2008; Weick and Sutcliff, 2007; Weick and Sutcliff, 2006; and Weick et al., 1999). Their collective work identifies five aspects that are present in all HRO implementations.

1. (5A1) A preoccupation with failure suggests that is to prevent failures by preoccupying itself with discovering them and their causes. Preoccupation with failure focuses on points of failure rather than success-focused
techniques. In other words, downplaying successes, increasing alertness, fighting inertia, and looking for alternatives. Identifying mistakes or errors, and, importantly, developing processes to eliminate the mistakes.

2. (5A2) A reluctance to simplify interpretations promotes a thoughtful process that considers the uniqueness of a problem before applying a solution. It discourages the form-fitting application or popular best practice solutions to problems without thorough consideration of the problem’s context. Reluctance to simplify is data-driven, treating each problem as unique. Over-simplification is difficult to overcome because simplification is easier - limiting the number of solutions that must be considered.

3. (5A3) A sensitivity to operations recognizes that a solution to one problem may create another and therefore process-wide measurement is essential to avoid this. Sensitivity to operations is similar to the concept of a “bubble” in Navy terminology that refers to the awareness of a ship’s overall condition in the moment. This is accomplished through continuously sharing real time data, shifting problems to experts, and engaging in face to face communication.

4. (5A4) An under-specification of structures refers to using of the highest level of expertise in improving reliability through the use of recognized experts, not necessarily the higher-ranking “boss”. Under-specification of structures discourages excessive formal ranks because the ranking individual may not be in the proximity when the event occurs, may be too detached from the event to quickly respond, or may not possess the requisite knowledge. This suggests that the lowest-level, front-line workers can often be the best to respond to process failures.

5. (5A5) A commitment to resilience encourages the use of individual initiative to maintain process improvements long-term. It encourages activities to prevent failures and relies on the expertise of front-line workers to reduce response time and counter immediate, evolving threats or “absorb” as much of the threat as possible at the lowest levels of the organization.

While Weick and Sutcliffe identified the aspects of HROs, they do not suggest a method for HRO implementation or why the aspects collectively improve reliability. In addition, they don’t identify how they measured reliability or to what level reliability increased as a result of the HRO effort. The purpose of this study is to examine an increase in process reliability through a successful HRO implementation in a healthcare organization using Soft Research Methods, moderated by Mindfulness techniques.

2.2 Soft Research Methods

Soft Research Methods such as Case Studies, Action Research, Soft Systems Methodology (SSM) are formal methods appropriate when examining How and Why questions because the research variables are typically ill-defined, where the presumed causal links in real-life interventions are poorly understood or too complex for surveys or experimental designs (Yin, 2014). This makes soft methods appropriate for exploratory research by addressing problems that are difficult or impossible to quantify, and involve multiple objectives inappropriate for traditional analytical techniques (e.g., Checkland, 2011; Checkland, 2000). Soft methods are appropriate for this study since the knowledge of How and Why real-world HRO implementations work is lacking in the literature (Ackermann, 2012). Soft methods, specifically SSM, have been applied to initiate problem-solving and research in many studies (Ormerod,
Over the years authors have discussed varying types and stages of soft methods (e.g., Rodriguez-Ulloa and Paucar-Caceres, 2005; Creswell, 2002). Checkland’s work on soft methods, which he refers to SSM, utilizes seven steps and they are:

1. (SSM1) Confronting/Identifying the problem situation (or Event)
2. (SSM2) Identifying the people, culture, or norms involved (i.e. the stakeholder’s and context)
3. (SSM3) Developing root definitions that describe the ideal system
4. (SSM4) Building a Conceptual Model or a diagram of the system
5. (SSM5) Comparing models to the real world which questions each relationship in the model
6. (SSM6) Identifying changes that are needed to the current system related to the problem
7. (SSM7) Taking action or using an action plan to implement the changes previously identified

While this study uses the seven steps of SSM described above, it does not use all SSM protocols mentioned in the literature. The missing element is the 5 E’s (Checkland, 2011) which are prescribed in SSM to measure effectiveness and efficiency, suggesting a balance is desirable between the E’s of efficacy, efficiency, elegance, effectiveness, and ethicality. But HROs are primarily concerned with reliability so therefore ‘reliability” is the key effectiveness measure and not the 5 E’s. Because of this, a full use of SSM is not claimed. The elements of SSM applicable to this study are heavily influenced by it and we followed the seven-step method - using government-approved outcome reliability measures for healthcare. Despite the framework suggested by SSM, implementing the seven steps varies widely with context.

2.3 Mindfulness

Mindfulness practices are qualitative techniques that encourage a high level of alertness to a job or task (Weick and Sutcliffe, 2006). It promotes an understanding among the players in how their actions contribute to improving process performance. Specifically Mindfulness techniques have improved reliability performance in healthcare (Matook and Kautz, 2008; Hales et al., 2012; Weick and Sutcliffe, 2006). Mindfulness is often operationalized through three activities; a) the use of frequent meditation by the participants in a process, b) a willingness on the part of providers to objectively solve problems using solutions unique to the situation and context, and c) take time to meaningfully communicate with other players on the problem at-hand. This is important because it challenges the global “best practice” approach which suggests that solutions
to a problem in one context will automatically work in a different context; which practitioners
know is not always true (Brown, and Duguid, 1999; Szulanski, 1996).

2.4 Integration of HRO-SSM with Mindfulness

In this case, the role of Mindfulness was to improve the implementation of SSM stages 1, 2, and 6 because it is a qualitative technique that encourages a high level of alertness to a job or task, as well as understanding among the players how their activities contribute to improve reliability for a client or customer (Weick and Sutcliffe, 2006). Mindfulness discourages using highly standardized solutions, referred to as best practices, that don’t adequately consider the uniqueness or context of the problem before developing solutions. The first step in Mindfulness, frequent meditation clears the mind of random thoughts so that full attention can be given to accurately identify an immediate threat to a patient, a problem, or their causes (SSM Step 1). The second step, encourages objective understanding of the context and stakeholders affected by an action (SSM – Step 2), and develops solutions that are more effective because they are context specific (SSM – Step 6). The objectivity encourages a detailed analysis of a situation so that the best solution is applied. In this RHC case, healthcare workers are encouraged to meditate 5-10 minutes every few hours, and then to clear their mind for 1-2 minutes before treating a patient. To prevent superficially reacting to an issue, providers are taught to (third step in Mindfulness) communicate with other providers frequently on patient condition and briefly evaluate how a treatment or action will affect each patient’s vital signs, collectively or individually. Figure 1 shows implementation model which shows relationship among the seven SSM steps, HRO Five Aspects, and three practices of Mindfulness, and their effects on improved reliability. It shows that the three practices of Mindfulness support the SSM Steps and implementation of the HRO Aspects (The noted SSM steps *1, *2, and *6 were found later to be the most affected by Mindfulness). The SSM steps supported all of the HRO Aspects, which led to demonstrable improvement in patient care reliability. How and Why they were affected is examined in the case study.

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Insert Figure 1

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Regional Health Care (RHC) decided to create an HRO unit to address a decline in critical unit performance. In the health and wellness literature, HRO is promoted because healthcare failures result in higher societal costs through higher healthcare costs and patient deaths (Hines, et al, 2008). The implementation began in the summer of 2010 in RHC which treats 4,000 patients annually. RHC typically receives its patients from other units when more intense and specialized treatment is required. The majority of patients come from the Emergency Center, the Trauma/Burn Unit, and the Operating Recovery Unit. The critical care unit is a 20-room facility occupying a whole floor of RHC with rooms around the perimeter of the floor, and an open-facing, central nurse’s station for visual monitoring of patient care. Administrative functions are performed in the nurse’s station with files of the patient’s medical chart, medication and treatment instructions, and incident report logs. The critical unit nurse supervisor, researchers, stand-by equipment, and volunteer-helpers called “candy-stripers” are located in the nurses’ station. Nurses involved in treatment rotate between the 20 patient rooms, returning to the station only to complete periodic paperwork.

3.1 Data Collection

Initial reliability data was collected from January, 2010 to December, 2010, which included baseline data (January- June) and implementation data (July-December). Follow-up data was collected through the summer of 2012. Data collection included direct participation by the researchers, non-participatory observation, review of relevant log books, and interviews with patients, nurses, supervisors, and RHC managers as suggested by Yin (2014). The interviews began with semi-structured questions developed in advance and then revised based on the responses and feedback from participants, following the interview method proposed by Kvale and Brinkmann (2009).

The researchers participated with the nurse-consultant in the training and mentoring of nurses, critical unit staff meetings, and nurse supervisors. The training was conducted over a two-week period, two hours per day after each shift. It included the explanation of the three Mindfulness techniques and demonstrations on how to meditate, the importance of the hourly breaks, and
examples on how to pause 1 – 2 min. between patients and effectively communicate important information. The nurse-consultant was a yoga instructor and spent two weeks teaching participants how to meditate. For novices, each day for two weeks she conducted a 30-min. class in the Mind-fullness room. During their daily observations the researchers provided feedback to nurses on the results of the previous days’ performance, observed new issues in the unit supervisors and volunteers, reviewed incident logs, observed nurse-patient interactions, and documented nurse and supervisor observations of HRO efforts. Most nurses use their lunch breaks to meditate and contemplate entries for their incident logs including observations of possible root causes of unit problems including a) RHC policies that they feel interfere with patient care, b) activities of supervisors/others in critical unit that harmed or improved patient care reliability, c) suggestions for improving reliability, and d) ideas or observations about how the five-aspects were implemented. The researchers used the data from the previous day in the training sessions and to perform a gap analysis. Nurses discussed the problems in using the techniques and their perception of the effect on patients. Next, a plan was developed to implement the suggested solutions and responsibility for implementation of each activity in the plan was assigned. The process was repeated each week, beginning with comparing the system progress toward ideal targets. This approach is often referred to as “Learning by Doing” (Hayes et al, 2004) where training of new techniques is followed-up by practice, normally conducted by front-line personnel on real-world problems. This is important because Hayes’ demonstrates that improvement techniques will fail to show an increase in performance unless managers develop “learning by doing” capability within their companies. Learning by doing is another soft methods concept that relies on first-hand (front-line) experience to solve problems rather than analytical concepts. The data collection cycle is shown in Figure 2.

3.2 Data Analysis
The analysis of the data was performed iteratively with a panel of healthcare experts comprised of the two researchers (R1 & R2), a nurse consultant, critical unit supervisors (Superv 1 & Superv 2), the RHC Chief Financial Officer (RHC Fin Chief) and three external members from
other RHC units. Each of the responses from the interviews were summarized and shared individually with the respondents to ensure that the researchers had accurately captured their meaning. Then, the expert panel was shown the implementation model in Figure 1 and the definitions shown in the Literature Review (SSM 1 -7; Mind 1-3; and 5A 1-5), and asked to evaluate the relationships between the three factors using the interview responses and their own observations, specifically identifying identical elements between factor, and then how one item affected another. To examine the activities of the effort a method of Q-sort was used to classify the opinions of the expert panel similar to Chakravorty and Hales (2008). Q-sort is conducted by placing the panel members’ observations on 3x5 cards and classifying them by similarities into fewer and fewer groups, in an iterative, multi-round process, until a consensus is reached. Because the classification scheme is based on the relationships, this approach is often referred to as Grounded Theory (Creswell, 2002). So the first step is to compare the definitions of each element and classify those they feel are promoting identical or supporting activities. The results of three rounds are shown below in Table 1. Because the full Q-sort involved examining 105 possible relationships (3Mind x 5Aspects x 7 SSM) across 6 respondents (630 Q-cards), only the results with strong support between the factors are shown, where Support Level = 3 - 6. Support Level in the “last” column reports the number of respondents supporting the proposed relationships shown in the “first” column. The details of how each factor moderated or affected the others are in the case descriptions.

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Insert Table 1

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3.3 Cost of Process Failures in RHC – Stated in U.S. Dollars $

In the critical unit, 10% of healthcare cost is for medical malpractice insurance, plus additional liability costs for high-risk treatment when an anesthesiologist, neurosurgeon or obstetrician is involved. Therefore, 90% of the external failure costs are built-in through insurance premiums that average $500/day/patient. RHCs share of liability claims is 10%, with the average malpractice award in the U.S. of US $1.81 Million, with roughly 77% of all claims in this award range (Karpoff and Lott, 1999); RHC’s share for each paid claim is estimated at $90,500. In the
U.S., malpractice claims occur in 3.7% of admissions, with 27.6% of these resulting in paid claims (Brennan, et al, 2004). In the U.S., 1.23/1,000 claims receive awards. With 4,000 patients per year, approximately five critical unit claims receive awards. Using an average $1.81 Million/award, payouts due to critical unit are estimated at $9 Million/year plus $410,000/claim in co-pays. This equals $2.5 Million/year for critical unit failure costs, but more importantly it equates to $11.5 Million in losses to the system. Implementing HRO could save RHC $2.5 Million/year, with system-wide savings of $11.5 Million.

4.0 Description of HRO Implementation

While supporting its strategic objectives, RHC prepared a detailed implementation plan using the seven steps described previously. It is important to note that we encountered multiple examples for each aspect of HRO as the implementation progressed. They are too numerous to discuss individually in a single study; therefore, examples selected for discussion were recommended by the panel and RHC managers. In the following discussion each aspect of HRO was sequenced and executed within the seven steps, including where Mindfulness was used.

A plan to implement the steps of SSM was developed between the researchers, the nurse-consultant, and the two supervisors, and the Chief Financial Officer. The plan was to spend

4.1. Soft Methods – Step 1 – Confronting/Identifying the Problem Situation

In HRO aspects, identifying the problem or potential failure is accomplished through aspect, A Preoccupation with Failure. This means that the unit is focused on identifying functions that can lead to unit process failures – those weaknesses or bottlenecks in the unit that affect reliability performance. Since the unit of analysis is the critical care unit and reliability of the unit prior to the HRO effort, from RHC’s perspective, is measured as the percentage of patients discharged alive. Viewing unit failure only as the death of a patient, interim mistakes on patient care are not perceived as critical as long as they are recoverable. During the unit meetings the participants realize that the unit’s performance is directly related to many possible failures along two dimensions – a) its ability to discharge patients alive (a dichotomous variable – true/false), and antecedents to this as b) stable vital signs (physiological indicators such as blood pressure,
pulse rate, and temperature; and behavioral indicators such as alertness, coherence, and agitation). As part of the effort, these become the unit’s measures of reliability. A preoccupation with failure that harms unit reliability now became the focus of this step. Critical unit personnel were asked to meditate for 10 minutes during their breaks each day and focus on potential failure points in the unit. Nurses and supervisors identified seven major factors that harm unit reliability, a) unqualified caregivers, b) unqualified volunteers, c) faulty monitoring equipment, d) poor nurse-physician understanding on treatment, e) slow nurse response time, f) inappropriate patient admissions, and g) patient intangibles. The unit releases patients either through a death certificate or discharge to other RHC units for further treatment, never directly from RHC. A preoccupation with failure treats any activity that threatens unit reliability as a potential failure.

Actors also identified several antecedents to the seven key failures that are in a unit supervisor inspection. They were asked not to presuppose any cause-effect relationship nor assign blame to individuals, but instead try to maintain objectivity and consider behavior, not perceived intentions or motivations of those involved. Traditionally, unit inspections were conducted somewhat informally at the beginning and end of each rotation to ensure the physical condition of the critical unit met minimum standards. For example, items on the inspections that affect “nurse-physician understanding on treatment” include the accuracy and timeliness of unit treatment and medicine. Another item is “cleanliness of the unit” which is the responsibility of the volunteers where failures can lead to source infections for the patients. The item “completeness of unit paperwork” can be caused by un-qualified nurses because critical care nurses must be trained on unit-specific paperwork need to order equipment maintenance, and replenish critical medication stocks. Each day, failed items on the inspection report were discussed at staff meetings and the owners of the failure were identified, with corrective action. The unit supervisor’s report is one method used to encourage a “preoccupation with failure” culture by focusing on proper training, equipment maintenance, supply/medication levels, among many others, that have harmed unit reliability in the past. Potential failure points are listed in the report, with the acceptable tolerances, where all conditions outside of the tolerances are flagged for corrective action. In one example, the shift’s refrigerator had food items left for days which created unhealthy conditions such as mold and odors in the critical unit. This created is a
potential failure because it encouraged nurses to store their food items outside the unit which meant they left the unit frequently, slowing the unit’s nurse response time to a patient emergency – a key driver of unit failure. Volunteers now clear the refrigerator of all food items after each shift, encouraging nurses to stay within the unit.

4.2. Soft Methods - Step 2 - Identify the People, Culture, and Norms involved

After the problem or opportunity is identified, Step 2 encourages relevant understanding of the people involved that affect unit reliability – i.e. Actors, Customers, Process Owners, and the culture and norms developed in the unit. This is referred to as context/environment in the Operations literature. This is important to linking the system inputs to outputs so that relevant variables and activities can be identified, and their relationships to unit reliability (outcomes) of the rates of “live discharges” and “stable vital signs”. One application of the HRO aspect A Reluctance to Simplify Interpretations literally means to stop oversimplifying problems and their relationship to unit reliability. It encourages questioning all assumptions related to solutions, or especially so-called “best practices” that have reportedly improved reliability in other critical units. It encourages the understanding of how change in unit policies or procedures affect unit reliability.

As the name implies, over “simplification” of the causes and effects of any failure point leads to ineffective solutions, and thus inhibits unit reliability. A Reluctance to Simplify implies discouraging the use of “best practices” often promoted in the Operations literature. This Step ensures that the process stakeholders are not “form-fitted” into some preconceived context that may or may not be accurate or beneficial to preventing failures. In the critical unit there are many norms that may affect reliability. First, there is a strong sense of diversity where appreciation of culture has harmed unit response time. For example, in the U.S. healthcare tradition it is culturally acceptable for men to treat women; however in Moslem cultures male physicians are typically not allowed to perform physical examinations of women. Another issue is language, where Spanish-only patients are becoming increasingly admitted and qualified caregivers and unit volunteers need to speak or translate treatment options to patients as well as families. These cultural considerations that affect response time and qualifications of caregivers
and volunteers are addressed in - Step 2. Mindfulness is especially helpful in this stage because it encourages nurses and physicians to take 1 – 2 minute breaks and clear their mind of all matters not related to the patient. It creates focus on the immediate threat and understanding of the unique characteristics of the problem to prevent hasty application of a treatment.

4.3. Soft Methods – Step 3 – Developing Root Definitions that Describe the Ideal System

Once the context is fully understood, this step builds on Step 2 by clearly defining the CATWOE – Customer, Actors, Transformation, Worldview, Owner, and Environment for those who make the unit safer, as well as the unit’s ideal state or condition. It is important to note here that the ideal condition does not have to be practical – at least in the beginning – it only needs to be accurately identified and clearly articulated. In HRO, this also can be used to encourage A Reluctance to Simplify, i.e. prevent Oversimplification, of a potential situation. Customers are the beneficiaries of the unit’s reliability and include societal benefits such as preserving life and families. Actors are all those participating in transforming inputs into outputs – those that create a reliable unit. The Transformation process defines what inputs are transformed, and how, into the outputs. The Worldview ensures that a safer unit contributes to society as a whole by preserving life and families that are the basis for modern society, and provides these benefits at less cost. The Owner is the entity with the legal authority and responsibility for the resources and process outcomes. The Environment considers the limitations on any solution driven by the operational context. With clear identification and consideration of these variables encourages A Reluctance to Simplify in HROs by identifying the current and ideal condition of CATWOE.

The use of a Current State and Future State maps, from the Lean literature, provide one type of diagram that meet this criteria.

In developing root definitions in HRO, the ideal system for all the players can be articulated with six brief statements. First, the Customers in the critical unit are not only the patients but society in general, because a reliable unit saves lives and reduces the RHC and insurance costs of unreliable processes. Currently millions of dollars in malpractice claims are paid on unreliable healthcare processes, so by improving unit reliability the societal costs are reduced. To the RHC managers and insurance companies, the ideal condition is to prevent patient claims for
malpractice. Second, the Actors are the participants in the critical unit, such as nurses, doctors, orderlies, volunteers, and supervisors who contribute directly to improve unit reliability. The ideal condition is for Actors to contribute to improving unit reliability by addressing the key drivers discussed earlier, i.e. faster nurse response, better understanding between nurse and physician, etc... Third, the Transformation Process in the critical unit is reflected in its performance measures. The primary inputs into the unit are critically-ill patients with unstable vital signs, and caregivers such as nurses, physicians, volunteers, plus medicine, equipment and supplies. The outputs are “transformed” patients who leave the unit. Successful transformations result in no malpractice claims to be paid by RHC or the insurance companies. Fourth, in the Worldview a safer unit results in the preservation of human life and reduces malpractice payouts by RHC and insurance companies. Reduced medical costs means that resources can be used to improve other departments of RHC and provide greater benefits for the owners. A root definition in SSM refers to a type of mission statement that encompasses the individual root definitions. The ideal condition and root definition for the critical unit is,

“Actors improve unit care reliability to 100% so that all patient lives are preserved, resulting in societal savings and no malpractice payouts for RHC or insurance companies.”

Fifth, the Owner identifies who controls resources and accepts liability for the unit. In RHC, the President and insurance companies ultimately control and are responsible for poor unit reliability. Sixth, the Environmental constraints in the critical unit are the conditions that limit the reliability of the unit, and for which the Owners have limited or no immediate control. This includes treatment recommended by a physician but not allowed by RHC or an insurance company. Another Environmental constraint is that the unit, unlike a business, can’t choose its patients and occasionally a patient is admitted who is inappropriate for the critical unit. The patients are either too sick, and thus should have been admitted to an Intensive Care Unit, or are too healthy and should have been admitted to a lower-level general admission unit. Constraints are usually identified by the events that are extremely difficult, or sometimes impossible to control by the process Owners and Actors, at least in the short term.

This step recognizes that conceptual models are needed to understand complex processes. After models are developed and diagramed they can be shared within and between other units and tested to evaluate accuracy of real-world processes. In HRO, model development can be used as one tool to create A Sensitivity to Operations. Sensitivity to operations activities can include the customer as well as extend beyond the unit’s customers to the Worldview, organizational, or social processes. In order to evaluate effects on other units of RHC soft methods encourages building conceptual models of how the unit works, showing activities and causal links so that there is common understanding among the Actors within and between units in how each operation affects unit reliability. Figure 3 is the conceptual model of the variables that affect critical unit reliability. It demonstrates the how the transformational process works from unit inputs to outcomes. This can facilitate sensitivity analysis, where the impact of a change in one operation or RHC unit can be can be evaluated for its effect on others, i.e. sensitivity to each operation.

Insert Figure 3

For example, because the critical care unit accepts patients only from other RHC units such as ICU, Emergency Room Services, Cancer Unit, General Care Ward, and physician’s offices; and then released back to theses units. The critical unit performance directly affects these other units, often involving numerous Actor interactions, relative to other RHC patients. Additionally, the unit admitting or receiving the patient can also affect the critical unit reliability.

During the implementation of sensitivity to operations, physicians and nurses from other units are encouraged to share their patient experience with physicians and nurses in the critical care unit, face-to-face, instead of exclusively through the charts.

4.5. Soft Methods – Step 6 – Identifying Changes Needed to the Current System
Identifying Changes in Soft Methods refers to identifying problems and solutions to change the process to a higher level of reliability. Identifying changes in a system must be recognized and measured, or else improvement can’t be achieved (Deming, 1986). In HRO, a change to a process is designed to improve reliability or respond to a process failure. Mindfulness methods were especially employed in this stage. Healthcare providers were asked to meditate on a specific issue for at least 30 minutes and conceptualize solutions to a single unique problem. This is in deference to applying a so-called “best practice” approach, where a standard solution is applied without consideration for the unique features of a patient’s problem. Patient issues can be so complex due to high variance in illness or injury type, degree of injury, age and gender of patient, patient attitude, etc. that traditional best practices can’t be applied. To facilitate this, an unused break-room, called the Mind-full room, was set aside with comfortable furniture, mats, and quiet areas for all providers to use. At the end of each break, the providers documented their ideas to discuss as a group later on. The Identifying Changes step can be used to encourage the timely recognition and reaction to actions that harm reliability. This is expressly recognized in HRO aspect An Under-specification of Structures which encourages the identification and implementation of actions/solutions to address or prevent threats at the lowest level of the organization. This is based on the idea that front-line workers and supervisors can recognize threats and try needed changes (potential solutions) much faster than working through a hierarchical rank (Brown and Duguid, 1999). Mindfulness supports Soft Method’s identifying “feasible and desirable changes” to counter immediate threats occurring at the lowest level of the organization. Under-specification of structures is a control model that suggests that control in HRO organizations should be relatively flat, not excessively hierarchical. Under-specification of structures also encourages the use of process experts to recommend changes instead of hierarchical command structures.

In RHC, as in many healthcare organizations, the structure is relatively flat. In the critical unit, nurse supervisors control manpower and assignments, while physicians control treatment. Nurses are the second level and are responsible for implementing the care. When a critical unit nurse executes a physician’s treatment protocol, this is identified in Soft’s Methods taking action. In under-specification of structures at the unit level, the majority of requests to
change/adjust treatment are generated by a nurse at the low end of the organizational structure, not the physician. Before recommending changes however, nurses were encouraged to mediate on the problem and discuss their ideas with peers before discussing with a physician. The inhibiting factor in implementing under-specification of structures in RHC has been the managed-care structures, which have become over-specified – structurally, meaning much of the unit control that affects unit reliability is held in hierarchical structures outside the unit.

4.5. Soft Methods – Step 7 – Taking Action or Developing an Action Plan to Implement Changes

At the unit level, this step is straight forward and encourages the implementation of a solution or at least an action plan where implementation may be complex and involve several steps. This step can also be used to assist HRO implementations because the under-specification of structures encourages the use of expertise, not rank, to develop and implement solutions. This means that the greatest expertise at the lowest practical level of the organization should be the ones who implement solutions because the finding in HRO literature is that they can be more effective.

In HRO, this is referred to as A Commitment to Resilience where organizations that have created high reliability process must put forth effort to maintain the reliability. Action plans encourage resilience because they can contain a protocol that specifies the activities to be executed when a failure occurs. In doing so, it prevents a failure from reoccurring or quickly recovers from failures that do occur.

Resilience is part of the action plan in RHC’s critical unit. For example, a key element for the unit is fully functional life-support equipment. The equipment not only monitors but can quickly initiate life-saving procedures when patient health is threatened. Due to rising costs, the unit had to share some newer, more effective equipment with the ICU. Since the ICU was considered a higher priority than critical care, much of the equipment was only minimally available. To minimize the chance that the equipment is not available for the critical unit, an action plan was developed called “critical locater”. The critical locator protocol can be initiated by any nurse or
physician in the unit. The steps are 1) need is verified, 2) quick search of the critical unit to identify if one is available, 3) if not available in the unit, a wireless tracking device is initiated that can provide the general location of any device in any department of the RHC, 4) the nurse calls the department and inquires status of the unit, 5) if available, the unit is rushed to the critical unit. The wireless tracker can identify if the equipment is on/off, and priorities those which are in the off status.

5. Results

As mentioned earlier, the RHC uses the suggested national guide on healthcare performance measures (NQMC, 2009) instead of the 5Es. The RHC measured Efficiency, Process, and Outcomes for the critical unit. These are shown in Table 2, Column 1. Column 2 reports the specific metrics that comprise each measure. Column 3 shows the benchmark data for six months, January, 2010 –June, 2010. Column 4 provides the data for 12 months, January, 2010-December, 2010, which includes the six months of implementation. Column 5 displays the data for 12 months, June, 2011 - June 2012, collected by the researchers in follow-up visits to estimate the impact of HRO implementation. The data for some measures were not provided to the researchers due for a variety of reason and these are shown as Not Reported (NR). In short, Efficiency measures the time and cost of patient care. While not directly related to reliability, the costs of patient care are essential measures to justify the benefits of HRO. As seen in Table 2 – the costs of patient care dropped by $100/patient during the period following the implementation, which reversed a long-term trend of increasing critical care costs. This improvement is partially driven by the fewer number of hours needed to achieve a successful discharge (70 hours/patient versus 75 hours) after the implementation.

The most important Process measure directly measuring reliability is c) percentage of patients discharged alive with stable vital signs. During the benchmark period, this reliability measure was 93.8%. After the implementation it increased to 99.5%, an equivalent improvement of 24 patients, given an increase in admissions of 22 patients, this is a statistically significant
improvement of 5.3% in critical care reliability. Additionally, Outcome measure b) mortality rate of AMI, and f) live discharge are also key reliability measures. The results suggest that fewer patients died from AMI, 1.5% before HRO, down to .9% after implementation, a 60% improvement in reliability. The percentage of patients discharged alive improved by 100%, going from 22 deaths per 1,997 admissions, to 22 deaths per 4,020 admissions.

While it is difficult to directly measure how the effects of using Mindfulness positively impacted performance, all of the nurses and many of the physicians used both the 30-minute meditation and the 1-2 mini-break techniques before treating a patient or recommending care. They all reported benefits of using Mindfulness in improving focus and attentiveness to patient needs. This supports the Mindfulness concept in that paying more attention to patients and their unique characteristics lead to improved care. The providers reported that the difficulty of using Mindfulness during heavy demand periods is the fact that care is often relegated to “putting out fires” and time to stop, even for a few minutes, is not practical.

These results objectively demonstrate that implementing the five aspects of HRO can improve process reliability. The reliability improvement between the benchmark period and the post-implementation period in 2012 are not only statistically significant but practically important since they represent the lives of real patients. Benefits of using Mindfulness were subjectively reported by 90% of the care providers.

6.0 Implications of HRO Implementation

The implementation of HRO works in this case because they contain the framework of Soft Methods utilized in conducting and implementing scientific principles. Although semantically different, the aspects of HRO are highly similar to those of SSM – i.e. they work because they appear to be recasts of the scientific method. Improved reliability of the critical care unit suggests that Soft Methods is an effective approach to guide HRO implementation. This means that a preoccupation with failure is an effective method to identify potential failures and problems that allow process failures. By using Mindfulness methods, the context is better understood and greater attention and identification of the stakeholders involved in the process (actors, owners, customers, and providers) was achieved. A reluctance to simplify a problem or
proposed solution, or misidentify the stakeholders can lead to poor understanding and the development of ineffective solutions, especially where there is a propensity to employ “best practices”. Next, the individual operations and processes that control the outcome must be diagrammed so that all stakeholders understand their role in preventing failures. This is especially important to creating sensitivity to an action to solve one problem – that may create another problem in the unit and sensitivity to this while developing solutions can minimize negative effects. Sensitivity to affects on other issues and attentiveness to patients was improved using Mindfulness meditation prior to recommending a change in care. Next, once the operations, processes, and their relationships have been identified, the individuals in the unit with the greatest expertise can be identified to manage these processes. Because “time is of the essence”, those with expertise closest to the failure have the greatest chance of responding quickly with the correct action. HRO assumes that unit rank may not specify expertise. Only after a solution has been shown to work can the unit move to ensure it is enforced. The enforcement of effective solutions requires discipline which can lead to process resilience. There are five implications of HRO implementation.

First, in HRO’s preoccupation with failure, RHC relentlessly pursued failures that harmed reliability. These efforts often began with providers meditating on where points of failure can occur in the system and the potential impacts, for at least 30 minutes per week. Interestingly, not much research is available on how failures are handled in organizations. Failure studies in organizations could provide incredible insights in improving performance (e.g., Capozzi, et al., 2013). In engineering, failures studies have been extensively conducted (e.g., Beer, et al., 2012) to improve material design. There is a need for failure studies in organizations, specifically on the mechanisms that identify failure points, how they are dealt with, and why despite these efforts organizations still fail over time? What do we learn from these failures to prevent future failures? Future research is needed in these areas.

Second, HRO’s reluctance to simplify interpretation was implemented by developing a robust context for the problem (e.g., root definition) to generate fitting solutions; and discourage applying preconceived solutions. There is a propensity in organizations to over-simplify their situation and adopt popular best practices, and eventually not improve their performance. In this
case, the Mindfulness and SSM methods encouraged communication and contemplation among the nurses and physicians to improve patient care through unique, targeted treatments, without the need for best practices. This is important because Mindfulness methods combined with “Learning by Doing” encourages reflection of these front-line providers, over-simplification can be discouraged. One of the physicians in this study admitted that “…during heavy demand periods, standard treatments are sometimes applied to patients without due consideration… due to the desire to relieve immediate patient suffering at all costs, even when an alternative treatment may be better long-term…especially in the use of narcotic pain killers…” This is important because, even after 50 years, there seems to be a paucity of published studies examining how Soft Methods can benefit organizations in United States (Checkland, 2011).

Third HRO’s sensitivity to operations was accomplished through conceptual models of the system and the validation of these models to adequately represent the real-world phenomenon. Organizational sensitivity and what-if scenarios can only be useful with adequate models. Examples in this case, such as Figures 1 and 3, help participants visualize the relationships in key processes in operations and implementation.

Fourth, HRO’s under specification of structures, which encourages decision-making at the lowest level of an organization, was implemented with soft methods approach to identify and implement best possible solutions. It is important to understand that, despite heavy promotion, there have been cases of improvement program failures in a variety of organizations (Beer, 2003). One reason for these failures is that improvements are driven from the top, with the help of external consultants, instead of front line workers who understand the process (Ko, et al., 2005; Vrakking, 2006). Mindfulness discourages the exclusion of front-line employees in decision-making, regardless of their rank. Practitioner research indicates that significant improvements do not take place until decision-making is pushed to the front-line employees of the organization (Robinson and Schroeder, 2009, p.33). More research is necessary to examine how to facilitate the adoption of SSM at the lowest-level of organizations, and how they interact with methods such as HROs and Mindfulness.
Fifth, HRO’s commitment to resilience was implemented in RHC by providing fully functional life-support equipment. Simplistically, resilience implies returning to stable state after a disruption. It is important to develop organizational resilience because disruptions could severely limit an organization’s ability to perform. According to Bhamra, et al. (2011, p.5375):

“…sometimes turbulent environment poses can vary in both severity and frequency and may originate internally or externally to a system. … These events can take many forms as highlighted in many recent highly publicized events including the 2004 Indian Ocean Tsunami, the 2010 Haiti and Chile Earthquakes, the recent global financial crisis and the 2010 eruption of Icelandic volcano Eyjafjallajokull. Natural disasters, pandemic disease, terrorist attacks, economic recession, equipment failure and human error can all pose both a potentially unpredictable and severe threat to the continuity of an organization’s operation. … It is often only through hindsight that disasters look like the events that individuals, communities, organizations and countries should have prepared for. It is not only disasters but also small uncertainties or deviations that can cause challenges to organizations.”

According to Sutcliffe and Vogus (2003) not much attention has been given to the resilience of organizations. The concept of resilience is known in science (Holling, 1973), engineering (Callister, 2003), organizational psychology (Powley, 2009), and supply chain management (Sheffi, 2007). There is a need to perform academic research in understanding organizational resilience and how to implement resilience in different business situations using soft methods.

7.0 Conclusions

HROs are organizations maintain processes with extremely low failure rates. Key aspects of HROs are: preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, under-specification of structures, and commitment to resilience. While we understand What the aspects of HROs are, we lack the understanding of How to systematically implement HROs and Why they work. The purpose of this research was to show How to systematically implement HROs using SSM in critical unit of a RHC. It also shows how Mindfulness techniques such as quiet mediation, mindful reflection, and communication are used to support and facilitate steps 1, 2, and 6 of SSM, and their counterparts in the HRO aspects. In doing so, this research contributed for both practitioners and academicians. For practitioners, this research showed How to systematically implement the five aspects of HRO using the steps of SSM, and how Mindfulness interacts with both to improve process reliability, that will eventually result in creating an HRO organization. Why the aspects of HROs work is due to the fact that they include the science-based framework of SSM, which can be supported though Mindfulness. While they differ in semantics, the aspects of HROs are very similar to those in
SSM, many of which the Mindfulness literature has shown to improve healthcare reliability. For academicians, this research identified several areas for future research. A graphical representation of the proposed relationships among SSM, Five Aspects, and Mindfulness is shown in Figure 4.

An important step in SSM is to reflect on the implementation process. One of the key issues the participants struggled with is how to best report the information on daily and weekly progress to participants, in a timely and concise manner. Nurses and supervisors already read so many procedural and patient charts that the thought of reading more reports became distasteful. One conclusion reached by the expert panel is that a tool to report essential information in Lean and Six Sigma implementations could have been applied here. The tool is called a “Toyota’s A3” report (Shook, 2009). The A3 report is an effective tool because it contains minimal text, relying primarily on pictures, diagrams, and charts to communicate key information in a timely and concise manner. According to Liker (2004) and Chakravorty and Hales (2013), world class companies such as Toyota routinely apply soft methods through A3’s to guide improvement efforts. Future studies should examine how A3 reports can be used to share the conceptual and implementation model recommended in soft methods.

Finally, Wieck et al. (2008) point out that several organizations have been severely harmed or even completely destroyed by a single incident of process failure. Harm can also occur in smaller doses as with healthcare providers who are no longer compensated for patient care related to mistakes by their own institutions. As these costs run into the millions of dollars per incident (McLaughlin and Kaluzny, 2004), the benefits of HRO implementations can have huge impacts. These process failure costs can also apply to the implementation programs themselves. When organizations attempt to restart failed improvement programs a unique set of problems is created. The healthcare unit refers to these restarts as Improvement Systems Recovery (ISR).
References


Ormerod, R. J., 1998. Putting soft OR methods to work: Information systems strategy development at Palabora, Omega, 26, (1), 75-98


**FIGURES**

![Implementation Model](image)

Figure 1 – Implementation Model
Critical Unit receives patient from ICU, EMS, Cancer Unit, Physician, General Care, etc...

Patient accepted, assigned a room by supervisor and attached to monitors by nurse

Physician (re)assigns treatment and reviews with assigned Nurse

Nurse orders medication and special equipment or revisions to orig. order

Nurse assigns Volunteers to help monitor patient and report changes for 24 hrs.

Vital signs are stable w/in 24 hrs.

Patient discharged to Physician or General Care Dept. or to ICU if prescribed.

Imagery: Figure 2 – Data Collection Cycle

Imagery: Figure 3 – Conceptual Model of Critical Care Unit
Figure 4 – The Graphical Representation

**TABLES**

Table 1 – Results of Q-Sort

<table>
<thead>
<tr>
<th>Respondent/Category</th>
<th>R 1</th>
<th>R 2</th>
<th>Nurse-Consultant</th>
<th>Superv 1</th>
<th>Superv 2</th>
<th>RHC Fin Chief</th>
<th>Support Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSM1 5A1 Mind1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>6</td>
</tr>
<tr>
<td>SSM2 5A2 Mind3</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>6</td>
</tr>
<tr>
<td>5A3 Mind3</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>5A5 SSM6 Mind1&amp;2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>5A5 SSM7</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>5A3 SSM4 Mind3</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>----------</td>
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<td>-------------------------------------------------</td>
<td>---------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>a) Total Cost for the CU Unit</td>
<td>$5,350</td>
<td>$5,500</td>
<td>$5,400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Total Cost per patient/day</td>
<td>1,997</td>
<td>3,998</td>
<td>4,020</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Number of patients/year admitted to CU</td>
<td>73 hours</td>
<td>75 hours</td>
<td>70 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Average number of hours in the CU/patient</td>
<td>87%</td>
<td>92%</td>
<td>94%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) Average bed occupancy/utilization</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>a) # of negative interactions between nurse and patient’s family</td>
<td>965</td>
<td>1,302</td>
<td>911</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) # of negative interactions between Dr. and patient’s family</td>
<td>NR</td>
<td>NR</td>
<td>144</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) reliability of patient care measured as the percentage of patients discharged alive – and stable</td>
<td>1,875/1,997=93.8%</td>
<td>3,974/3,998= 99.4%</td>
<td>3,998/4,020=99.5%</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>d) number of incidents of improper medication, dosage, or timeliness by CU</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>e) number of improper/unnecessary notification to physicians</td>
<td>341</td>
<td>510</td>
<td>120</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>f) number and duration of unit equipment failures – average time to repair/replacement</td>
<td>32 – 3.5 hours</td>
<td>61 – 3.25 hours</td>
<td>71 – 2.25 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>g) number of failed shift-supervisor inspections for cleanliness, orderliness, and aesthetics</td>
<td>53/550 = 9.6%</td>
<td>87/1100 = 7.9%</td>
<td>21/1100 = 2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>h) number of CU unit policy violations such as visitation hours</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcome</td>
<td>a) accidental patient lacerations by nurse or physician</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) mortality rate of AMI (Acute Myocardial Infarction) measured as [# of AMI deaths/# of AMI live discharges]</td>
<td>10/642 = 1.5%</td>
<td>14/1,310 = 1.1%</td>
<td>13/1,312= .9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) acute stroke mortality rate measured as [# of stroke deaths/# of stroke live discharges]</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) central-line associated blood stream infections (CLABSI)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) death of surgical patients with STCs (Serious Treatable Complications)</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>f) live discharge [# of deaths/# of admissions]</td>
<td>22/1,997 = 1.10%</td>
<td>24/3,998 = .60%</td>
<td>22/4,020 = .55%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Our responsibility is to provide strong academic programs that instill excellence, confidence and strong leadership skills in our graduates. Our aim is to (1) promote critical and independent thinking, (2) foster personal responsibility and (3) develop students whose performance and commitment mark them as leaders contributing to the business community and society. The College will serve as a center for business scholarship, creative research and outreach activities to the citizens and institutions of the State of Rhode Island as well as the regional, national and international communities.

Mission

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