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Respiratory Therapy Staff Retention: A Systems Thinking Approach

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**RESPIRATORY THERAPY STAFF RETENTION:
A SYSTEMS THINKING APPROACH**

by

Jerin George Juby

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Management
in
Strategic Leadership

at

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Dedication

Dream is not that which you see while sleeping it is something that does not let you sleep.

A.P.J. Abdul Kalam

This dissertation is dedicated to dreamers. Dreamers like Noah dreaming their future in an ark, Moses dreaming the promised land, Paul dreaming a world filled with faith, hope, and love, the early fathers of the Church who dreamed about the Gospel across the world, Mohandas Karamchand Gandhi and Martin Luther King Jr. dreaming a free and just society, and many more.

This dissertation is dedicated to those working day and night to pursue their dreams, challenging and pushing themselves to the next step, even when the path is not clear. This dissertation is dedicated to those who inspire and motivate those around them to take the next step, tackle the challenge, step into uncomfortableness, and lead the way. This dissertation is dedicated to the millions of people caring for others every day, especially in health care, respiratory therapists, nurses, technicians, therapists, doctors, and all other fields helping people every day to catch their breath, stand on their feet, and take the next step, perhaps to fulfill their dream.

This dissertation is dedicated to the Doctor of Management in Strategic Leadership family at Jefferson, especially my advisor Dr. Larry Starr, and all the faculty and colleagues in the program. I also dedicate this dissertation to the late Dr. Russell Ackoff, whom I never got to meet. This dissertation and my thought processes are deeply influenced by his writings and lectures.

This dissertation is dedicated to my church and spiritual family at St. Thomas Church, St. Luke's Church, and Christ Culture, specifically Rev. Fr. M. K. Kuriakose, Rev. Fr. Gheevarghese John, and Br. Reji Kottaram.

This dissertation is dedicated to Dr. Larry Gould and the late. Dr. Marla Sturm-Gould who adopted all of us as their family and kept on continuously inspiring us to dream higher. This dissertation is dedicated to my family, especially my wife, Minu Jerin, and my children, Jeremiah, Jonathan, and Esther. This dissertation is dedicated to my parents, my in-laws, and my grandparents, especially my mom Annamma, who filled the seeds to dream in my heart and is watching this from heaven.

Ultimately, I dedicate this dissertation to my Lord and Saviour Jesus Christ for constantly reminding me of his presence in my life, that he is in control. When I dream, I look into the skies, and the skies remind me:

The heavens declare the glory of God, and the sky above proclaims his handiwork.

Psalm 19:1

I too am his handiwork!

Jerin Juby

April 2023

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I dreamed about completing a doctoral degree for a while. Then, I started following the Doctor of Management Program at Thomas Jefferson University, and finally, in 2018, I made the decision to reach out to the Program Director, Larry Starr, Ph.D. I met him and fell in love with the program. I want to thank Larry for continuously pushing me but yet with care, compassion, love, and respect and reminding me of the purpose of the work. It's not about a degree but about a transformed being looking at and interpreting the world with a renewed mind.

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The system that I'm in, interconnected and weaved into my beautiful universe, is beyond words. I thank you and love you all!

Abstract

Respiratory therapists are an integral part of the healthcare workforce in the United States. The healthcare workforce shortage accelerated by the COVID global pandemic has impacted respiratory therapy departments across the nation, with organizations struggling to hire and retain staff. The prevailing approaches in combating this is linear in nature and does not consider the complexity of the system. The purpose of this dissertation is to address retention issues in respiratory therapy departments from a systems thinking approach and to develop a prototype utilizing systems thinking methodologies and tools.

Keywords: respiratory therapist, retention, interactive design, cynefin, complex systems

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CHAPTER 1

INTRODUCTION

Overview

Too often, proposed solutions to problems are developed by first simplifying the problem into smaller parts and then solving each part separately (Gharajedaghi, 2011). In the prevailing approach to management, simplifying the components of an administrative or leadership problem into smaller and simpler elements often understood as independent variables, helps leaders define solutions (Meadows, 2008). This is because problems in traditional management theory and practice are understood from an analytic linear cause and effect mindset, where the search for a root cause leads to deconstructing a situation into individual parts, anticipating that the properties of each part will be understood, and built back up to understand the whole (Jackson, 2003).

The interconnectedness of the parts is not always considered in reductionist and analytical thinking (Gharajedaghi, 2011). In the analytic and linear mindset, formulating a difficult challenge such as COVID-19 leads to the premise that COVID is primarily a health problem so should be addressed by experts drawn from health professions (Pourdehnad, Starr, Koerwer, & McCloskey, 2020). Yet, the systemic perspective of COVID is that it may be understood as more than a health problem; it is also an education problem which shifted hundreds of millions of teachers and learners from face-to-face to virtual/online channels; and an economic and labor problem as evidenced by the massive number of employees leaving the workforce for different careers or different institutions. The emergence of COVID in interaction with other subtle and longstanding contextual forces co-produced problematic challenges that began in the first year of the pandemic and which impacted many industry categories including healthcare globally. One of these co-produced outcomes has been labeled the *great resignation*,

because of its effects on staff retention. Anthony Klotz, associate professor of management at Texas A&M University was the first to suggest a “great resignation is coming...because when there is uncertainty, people tend to stay put, so there are pent-up resignations that didn’t happen over the past year” (Cohen, 2021).

Staff retention issues have been one of the major areas of focus in healthcare for several reasons. Organizations try hard to retain talent that they have worked hard to develop often after weeks (or months) of training. Respiratory therapy, along with several other clinical health professions has been impacted by the complexity of turbulent environment one influence of which has been the perceptions of people about the characteristics of their jobs. Initial staffing shortages were due to massive COVID exposures and illnesses, multiplied by high number of inpatients needing additional clinicians. Hospitals around the United States especially in cities with high COVID cases responded in a linear cost-benefit competitive manner by seeking and hiring temporary staff to whom they paid extremely high salaries. For example, the average pay for a full-time Respiratory Therapist (RT) in Philadelphia at the beginning of COVID was approximately \$37/hour, whereas the part-time, limited-contract RT rate due to sudden shortages was approximately \$80/hour. This competitive difference motivated additional numbers of full-time people to shift to part-time contracts and motivated institutions to increase the hourly rate of full-time RTs to retain them. At Jefferson Health, for example, this became a losing strategy. While they increased the average full-time rate of RTs by 8%, new agency part-time contracts increased tremendously to \$140-150/hour. These new staffing contracts were typically for 13 weeks but often extended. The impact was that an increasing number of Respiratory Therapists (RT) traveled to other cities and states to make considerably more income due to this financial opportunity. Full-time staff leaving for high-paying temporary positions caused a ripple effect

that increased because of Human Resource policies that limited an organization's ability to hire only temporary staff for open positions.

The approach taken by leadership for managing retention has been mostly based on conventional analytic and linear decision-making and problem-solving strategies. This focused on giving direct financial compensation and other monetary benefits in exchange for remaining in an organization, which has not proven to be a successful practice in the current context. From an analytic and reductionist point of view, additional compensation was believed to be a quick, easy and obvious option, but in reality, was an inadequate solution. Increased compensation may have helped certain organizations which were already struggling with regional inequities, but it helped only until other organizations raised their part-time compensation. While other aspects of employment and retention such as location, type of work in the hospital, and staff burnout, are contributing reasons for massive staff departures, RT administrative leaders who reduced the problem to a single cause, e.g., salary, misunderstood the importance of framing this as a complex system problem.

I argue that RT retention should be appreciated as a complex system problem that requires appropriate framing for problem formulation and for problem intervention. I also argue that to do both requires using a mindset specifically involving a systems-thinking approach. I argue that adhering to systems premises and assumptions will help leaders and organizations managing respiratory therapy to make better decisions and to more effectively strategize the retention of respiratory therapists.

This dissertation will focus not on best practices in retaining staff – an analytic assumption and methodology (Snowden & Boone, 2007) - but rather on describing best processes in retaining staff specific to the context and environment that the organization is in.

This systems approach may also provide a model for managing retention issues in other healthcare and non-healthcare disciplines. Three major themes are important in this discussion. First, I argue that examining and framing from a systems perspective is essential for a complex systems problem (Jackson, 2019). Second, describing the characteristics of a complex adaptive organizational system is essential to appreciate the methodologies and tools appropriate for navigating this kind of problem. Third, to address implementing change (or solving) this kind of problem, I argue that the social system methodology of interactive planning and idealized design (IP/ID) is appropriate.

Respiratory Therapy

Brief History

The origins of respiratory therapy began in 1943 in Chicago, when Edwin R. Levine, MD used on-the-job trained technicians to provide supplemental medical oxygen inhalation therapy. Later, this was formed into the Inhalation Therapy Association (ITA), which was later renamed as American Association of Inhalation Therapists (AAIT) in 1954, and then as the American Association for Respiratory Therapy (AART) in 1973, and American Association for Respiratory Care (AARC) in 1986. In 1954, the New York State Society of Anesthesiologists and the Medical Society of the State of New York formed a Special Joint Committee in Inhalation Therapy to establish “the essentials of acceptable schools of inhalation therapy.” In 1960, American Registry of Inhalation Therapists (ARIT) was formed to administer registry exams for formal credentialing. First exam was held in November of 1960. In 1963, the Board of Schools of Inhalation Therapy Technicians was formed in Chicago which later became Joint Review Committee for Respiratory Therapy Education (JRCRTE) in 1970. In 1974, the National Board for Respiratory Therapy (NBRT) was formed, becoming National Board of Respiratory Care

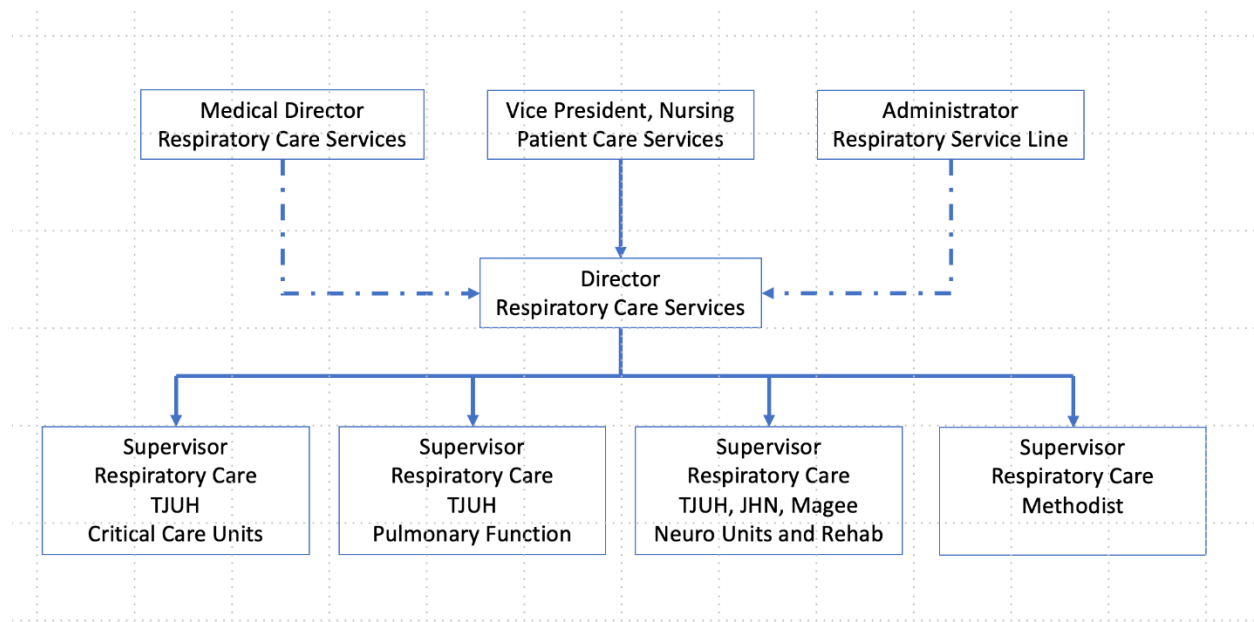
(NBRC) in 1986. In 1982, California passed the first modern licensure law governing the profession of respiratory care, and President Ronald Regan proclaimed the National Respiratory Care Week. In 2004, Vermont became the last U.S. state to pass a licensure effectively bringing legal credentialing to all 48 contiguous states (Timeline and History, 2022). Over the past seven decades, respiratory therapy has evolved and emerged, and has become an integral part of most of the acute care and long-term care hospitals. Further advancement in acute care and outpatient care is in the future with developments like Advanced Practice RT (APRT) is a look to the future. (Advanced Practice Respiratory Therapist, 2022).

Jefferson Center City Respiratory Care Department

At the Center City division of the Thomas Jefferson Hospitals, Inc. branded as Jefferson Health, there are approximately 110 respiratory therapists. The department is divided in to four inpatient and three outpatient locations. Inpatient locations include Thomas Jefferson University Hospital (TJUH), Jefferson Hospital of Neuroscience (JHN), Jefferson Methodist Hospital (JMH), and Magee Rehabilitation Hospital (MRH). The first two are academic medical centers, third is a community hospital, and fourth location is an acute care rehabilitation facility. The majority of RTs are staffed in the inpatient locations. Outpatient locations include Pulmonary Function Testing (PFT) labs at the Jane and Leonard Korman Respiratory Institute (KRI), and PFT lab and pulmonary rehabilitation at Methodist hospital. Leadership of the department includes one director, one manager, and four supervisors (Figure 1). The department reports to the Department of Nursing, and has an indirect reporting responsibility to respiratory service line.

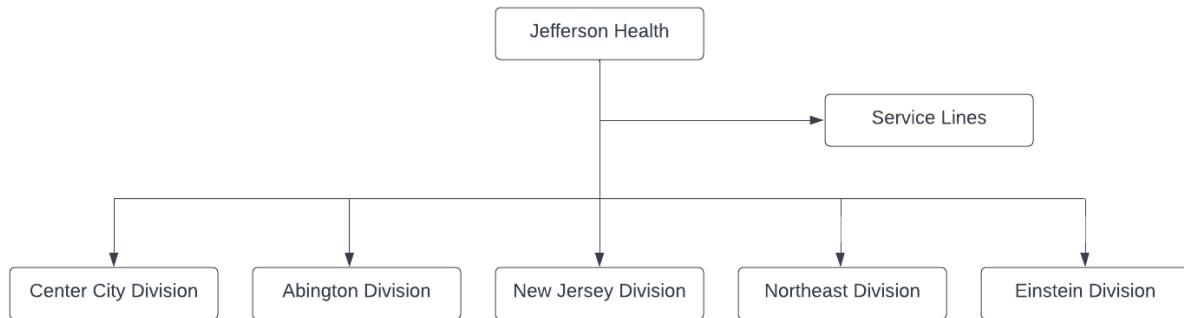
Figure 1: Jefferson Center City Division Organizational Chart

Figure 1. Jefferson Center City Division Organizational Chart



Clinical operations of Jefferson health is organized as divisions and service lines. The divisions are Center City, Northeast, New Jersey, Abington, and Einstein. Each of these divisions have multiple hospitals, outpatient practices, and other clinical services. Clinical services at these divisions are further categorized as service lines based on clinical and operational needs. Some of the clinical service lines are respiratory, neurology, cardiothoracic surgery, cardiology, etc., where as some of the operational service lines are nursing, care coordination, etc. Clinical service lines are primarily specialist practices such as pulmonary, neurology, and cardiology that are integrated (or are in the process of integration) across the Jefferson enterprise. Operational service lines such as nursing and care-coordination are usually non-physician led focusing on their operational needs. For example, the nursing service line is developed to integrate nursing operations across the enterprise. Figure 2 represents a high-level view of this structure.

Figure 2. Jefferson Health clinical enterprise structure



The enterprise does not have a respiratory therapy service line. Respiratory therapy departments at the Center City division and Abington division report to nursing, whereas at all other locations they report to hospital operations (non-nursing). Operational budget, performance evaluations, and other operational aspects of these departments fall under the division and their appropriate reporting structure. For all enterprise-level projects such as market adjustment, capital planning, etc., these departments work with the service line. The respiratory service line oversees enterprise-level respiratory therapy initiatives, along with the management of all aspects of pulmonary practices across the enterprise.

Staffing Model

Two types of inpatient respiratory therapy staffing models exist at the Center City division of Jefferson Health. At TJUH and JHN, the RTs are assigned only to do high acuity respiratory management including ventilator management, non-invasive ventilation, high flow oxygen therapy, acute emergencies, etc. At JMH and MRH, RT staff along with high acuity items including ventilator management, non-invasive ventilation, high flow oxygen therapy, acute emergencies, etc., also manages low acuity respiratory treatments, and routine care of tracheostomy airways, etc. Both models are in use at hospitals across the nation, but it is important to appreciate how these models fit into the individual hospital systems.

Systems Thinking Characteristics

Purposes

Organizations may be thought of as social (or organizational) systems, which include members and groups who may collaborate in several internal and social sub-systems. In social systems, parts (including people) and the whole (groups and teams of people) are purposeful (Ackoff, 1999). Indeed, each part (person and group) may have their own purposes that they are passionate about that may or may not align with the purpose of the organization. For example, in a Respiratory Therapy department, a manager may have deeply held beliefs and social obligations with a religious community which influences attitudes and values in the workplace whether or not these attitudes or values are part of the organization's vision, mission or operational culture.

Essential Properties and Improvement of the Whole

A system is a whole that has one or more essential properties that do not exist in any of the individual parts. Hence, a system's performance and outcomes are the result of the interactions between the parts. For example, in a mechanical system such as an automobile, the essential property is transportation which does not exist in any of the parts considered alone (Ackoff & Wardman, n.d.). Because performance of the whole system is determined by the interaction of the parts, improving the performance of one or a small number of the parts will not result in the improvement of the automobile's transportation function; rather, it may worsen this function, an outcome referred to as the suboptimization effect (Applebaum, 1975).

A similar situation may be understood in a biological system such as the respiratory system which consists of the organs and tissues that enable breathing. This system includes the airway (nose, mouth, throat, voice box), lungs, blood vessels and muscles that move the lungs.

These parts must work together for oxygen to enter the blood stream and reach the other organs including the brain, and for waste gases such as carbon dioxide to exit. Again, performance of the whole respiratory system is determined by the interaction of these parts, and focusing on improving a single part will not necessarily improve a person's breathing.

In a social system, similar system rules apply. The central property of a Department of Respiratory Therapy is to support the clinical management of patients with respiratory complications in collaboration with nursing, physicians, and other appropriate departments which do not occur when considering one or only some of the parts. The organization and function of respiratory departments vary between institutions. Based on the suboptimization effect (Hitch, 1952), improving one or a small number of RTs will not necessarily improve the overall departmental function, and may lead to lowered productivity.

At Thomas Jefferson University Hospital (TJUH), respiratory therapists are unit-based, where they have an assigned primary unit where the majority of their shifts are based. This aspect of the organizational system was established to allow respiratory therapists to be specialized in their area and to develop closer bonds and improved team culture, as opposed to rotating between several units. However, when fewer staff were available due to COVID-19 and it became necessary to bring in temporary staff to cover open shifts, the closer bonds were not developed and team culture was not improved; rather, the overall functioning of the department was reduced.

Temporary staff, although licensed and holding the appropriate credentials, are contracted for a short period of time (typically 13 weeks). After an orientation of 3 shifts, they are expected to "figure out the culture." In comparison, a full-time respiratory therapist receives 6-8 weeks of orientation at TJUH, and a pool respiratory therapist receives 6-7 shifts. Both are adjusted on a

need basis if additional training shifts are required. Except in certain cases, the temporary staff members are expected to complete the tasks associated with their daily activities. They are expected in the department only for a short time-period, even though some may choose to accept a full-time or part-time opening if available.

Clinical roles require much more than the completion of a list of tasks. Interdisciplinary teams are an important part of clinical management, even though these may vary depending on the organization. For example, some organizations may have a large group including physicians, fellows, residents, nurses, pharmacists, therapy, and more, whereas some organizations (small community hospitals) may only have a skeleton crew. Regardless, it is important for the team members (interdisciplinary and departmental) to develop a sense of report and to work together to meet common goals and purposes. Indeed, identification of the primary property (purpose) is essential in social systems (Ackoff & Emery, 2017). From a systems-view, the stakeholder-members of the team include not only the health care providers but also the patient and the patient's family. Interactions between all the stakeholders, i.e., the clinical and patient personnel are an important aspect of safe and effective patient care outcomes.

These differences may be appreciated when examining a traditional organizational chart within a medical center (Montgomery, Doulougerie, Georganta & Panagopoulou, 2013) as presented in Figure 3 which is similar to Figure 1. Figure 3 shows the reporting structure of roles but does not show which roles interact or who works with whom on any functional or team project activities. The organization chart also restricts itself to organization employees; it does not include the patient or the patient's family all of whom are stakeholders in the outcome of health services provided. Compare this with Figure 4 which presents a systems-informed influence diagram of an interdisciplinary team.

Figure 3. Organizational chart reflecting disciplinary departments in a medical center

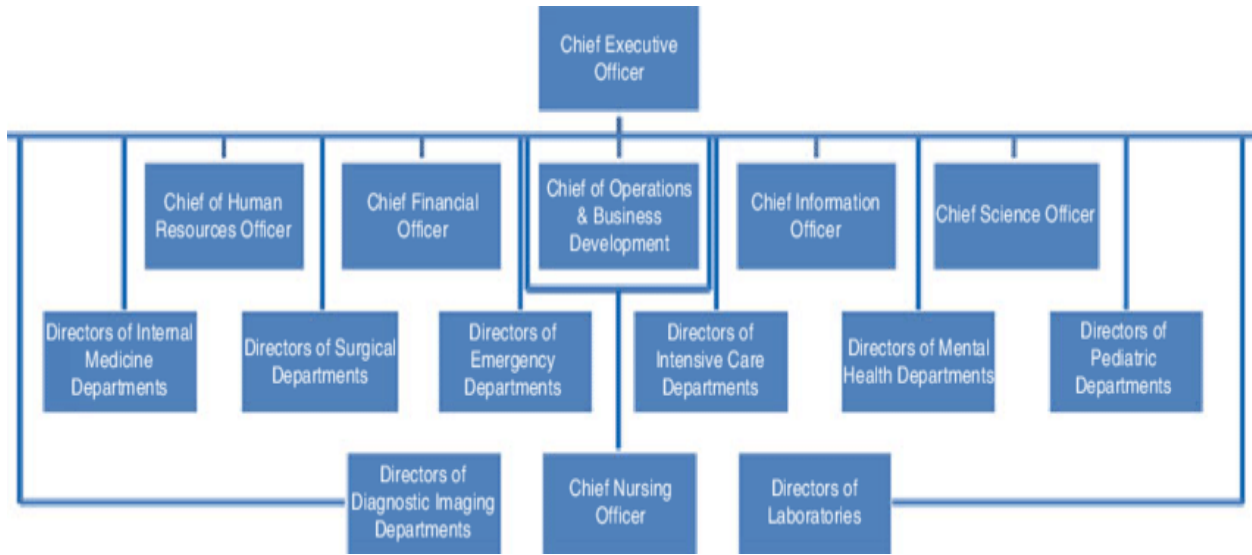
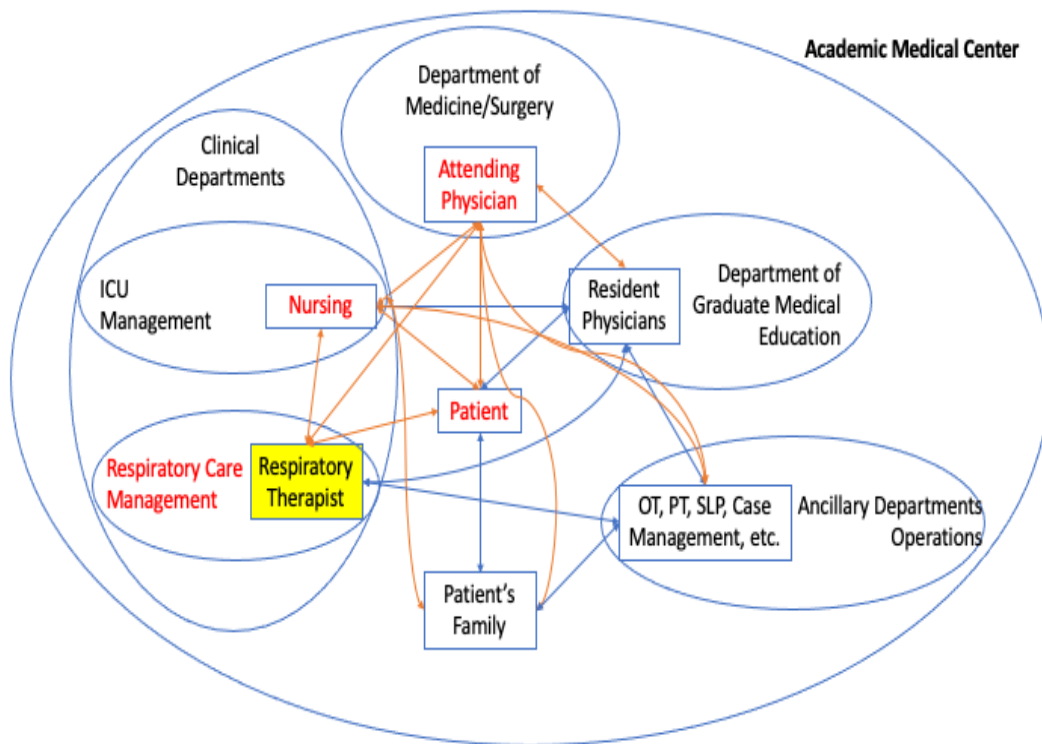


Figure 4. System-informed influence diagram of relationships within an academic medical center



The system architecture portrayed in Figure 4 presents the interrelationships between RTs, Nurses (RNs), Physicians, Case Workers, Patient and the Patient's family. In certain cases, healthcare clinicians switch between their primary units for staffing and coverage needs. An RT or RN primarily working in the cardiac intensive care unit (ICU) may be assigned because of sudden need to another ICU. Such changes, can co-produce reduced effectiveness within the system due to the lesser familiarity (and experienced relationships) with the interdisciplinary team, culture, and practices of the other unit. If the focus of the respiratory therapist is on completing ordered tasks, it will appear to be a lesser problem, but high functioning teams demand the active participation of all involved experts. This level of participation provides intrinsic motivation, value of work, and a sense of job satisfaction (Janus, 2014).

System Metaphor: The Iceberg Model

The Iceberg model (Figure 5 and 6) is a systems-thinking tool and a metaphor for describing and understanding social and organizational systems described by Kim (1999), where the visible portion (tip of the iceberg) represents the obvious observed events and situations while below and often unseen are the interactions, relationships, and patterns. These parts have several linear and nonlinear connections.

Figure 5. Iceberg Metaphor (image from Starr, 2018)

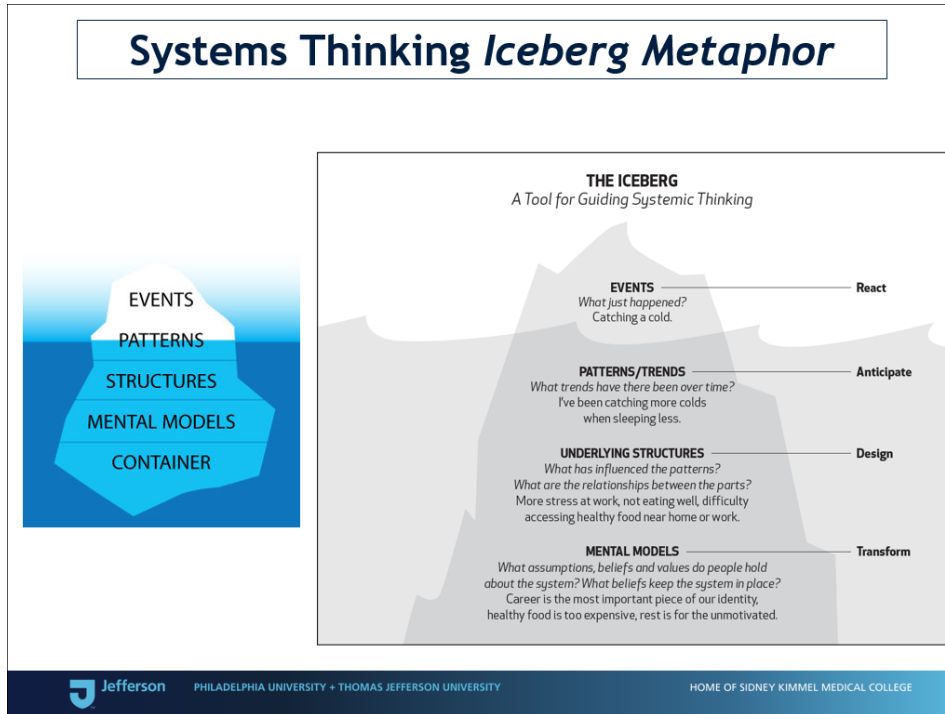
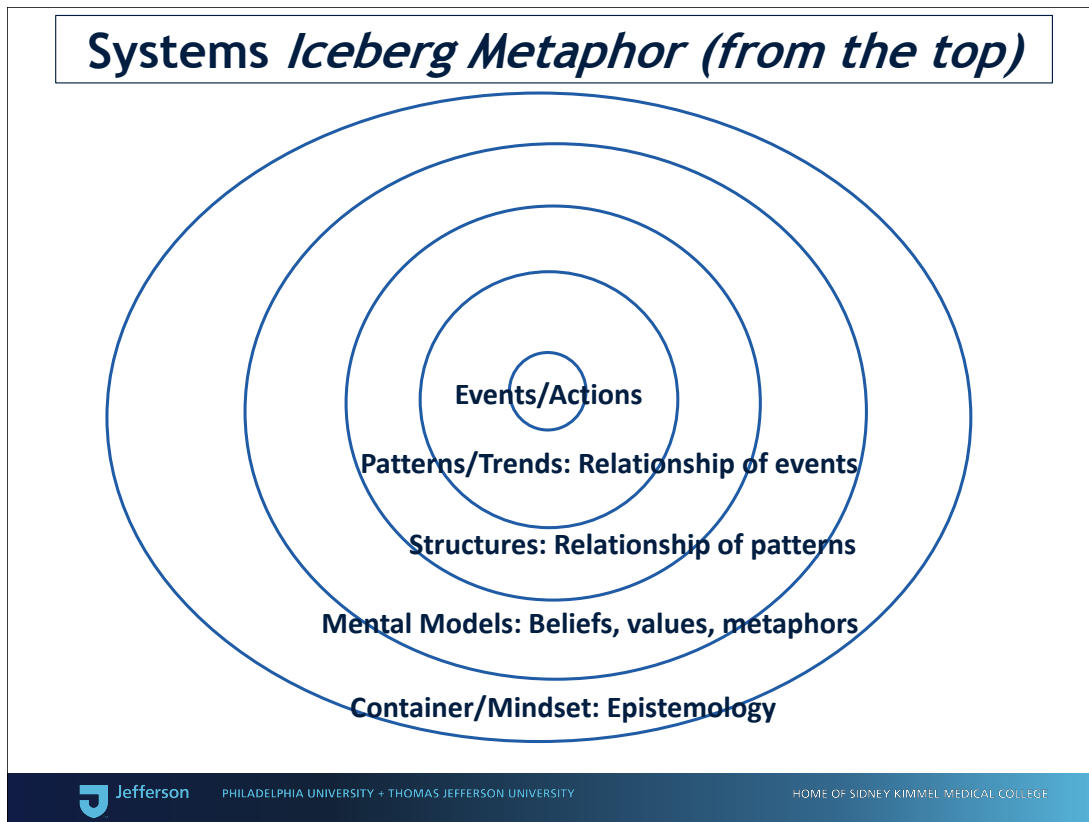


Figure 6. Iceberg metaphor, view from above (image from Starr, 2018)



In the systems iceberg, the events represent “the occurrences we encounter on a day-to-day basis” (Kim, 1999, p. 4). Resignation of an employee an error in patient care is such an event. Organizations typically react to such events. In the case of several employee resignations, one of the first approach to deal with it is some type of financial incentive. In the case of safety errors, the usual approach is deductive and reactive, “to look at what had gone wrong for patients and try to stop it happening again” (Cross, 2018, p.176). Often, this boils down to the processes and any individuals involved, and minimal attention is given to the containing system, context, interrelationships between the involved components, systemic patterns and structure.

Patterns or trends, in which events are contained and understood, are the next contextual influence in a systems view of reality. These refer to “accumulated memories of events” (Kim, 1999, p. 4). While we may describe events as unique events or behaviors, an expanded system view may identify a pattern of several employees resigning, or the repetition of several safety errors which are examples of patterns or trends. Expanding further leads to systemic structures, which are patterns of patterns and refer to “the parts of a system that are organized” and which may significantly influence “the patterns and events we observe” (Kim, 1999, p. 4). The interacting parts and the relationships in the systemic structure generate forces that cannot be easily measured or appropriately accounted for. This is the “foundation that supports and creates the behaviors higher up in the pyramid” (Cunliff, n.d., para. 7). Policies and procedures often represent these systemic structures (Cunliff, n.d.). These policies and procedures are also open to interpretation. For example, a vacation policy that guarantees employees time off two weeks per year is part of this systemic structure.

From a systems dynamics perspective, Monat and Gannon (2015) wrote,

events and patterns (which we can observe) are caused by systemic structures and mental models, which are often hidden. Systemic structures are the organizational hierarchy; social hierarchy; interrelationships; rules and procedures; authorities and approval levels; process flows and routes... (p. 19).

The iceberg metaphor in figure 5 and Monat and Gannon's view on systemic structures and mental models causing events and patterns is an arguable view from systems thinking perspective. Events and patterns in a system are not a result of linear interactions but from interactions, interdependences, and influences among situations and elements and between and among the contextual characteristics (containing or expanded). The iceberg metaphor in figure 6 is reframed as concentric circles allowing an expanded view of the system, which can further extrapolated by pointing out the interactions, interdependencies, and influences of the elements of the containing system.

Mental models are people's conceptualizations of the functioning of the world, and these vary from person to person, and is always evolving based on the interactions with the environment (Norman, 1983). It is the overwhelming set of assumptions one holds about reality that shapes everything we experience. (Starr, 2018). The systemic structure is influenced by mental models, the underlying beliefs, assumptions, and values people hold about the system. These assumptions provide the "blueprint" for the systemic structures and are also called "systemic structure generators" (Kim, 1999, p. 5). Mental models impact both development and practice of policies and procedures. A person with an analytic/mechanical/organic mindset will interpret what happened during COVID very differently than one who holds a social systems mindset. The iceberg metaphor/model shows the various structures that can explain "what" happened. It is the differing mindsets, i.e. analytic vs systemic, that describe "why" it happened

and “how” it is interpreted. An analytic mindset is linear where events are described as causal, whereas a systemic mindset is non-linear where events are understood as co-produced by multiple elements in the system.

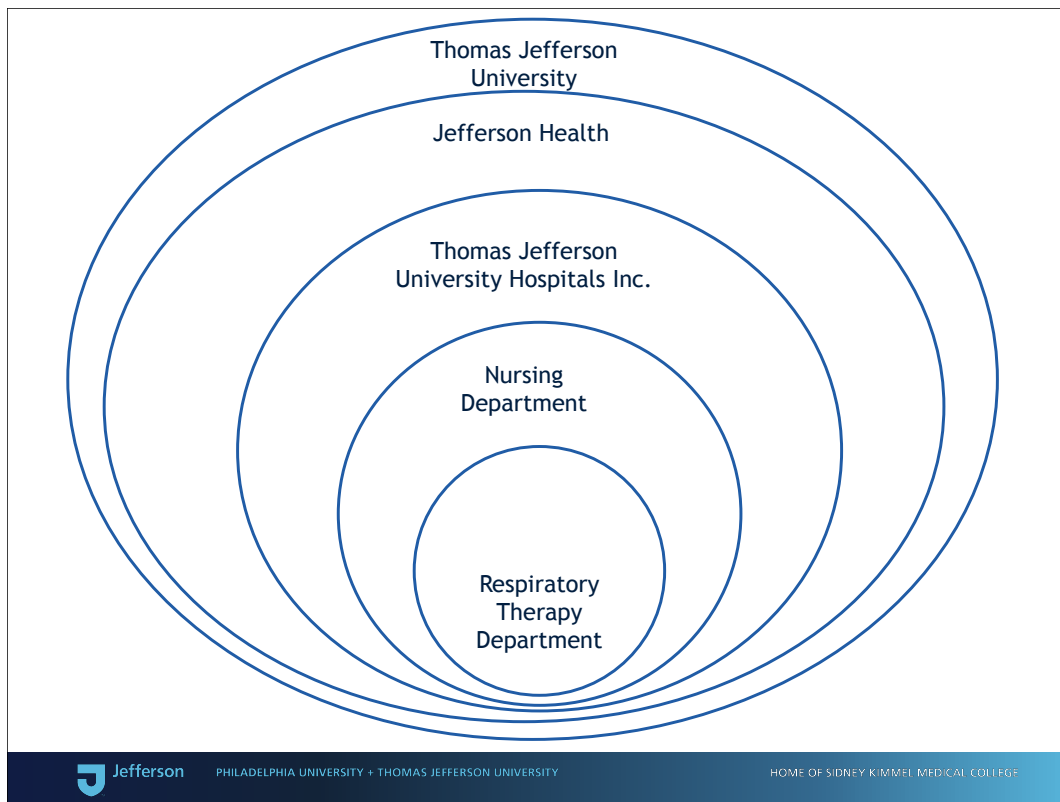
The implications of this may be appreciated in the following: During the first and second COVID surge, the respiratory department chose to let staff clock out and leave right after reporting (documenting activities) to avoid congregating in the staff area near the time clock. Usual 12-hour work shift is from 6:45 a.m./p.m. to 7:15 a.m./p.m. which includes the mandatory lunch break of 30 minutes. Shift report and transition happens from 6:45 a.m./p.m. to 7:15 a.m./p.m., but reports are usually 5-10 minutes in length. This caused a large number of staff members congregating in the staff room or at the time clock, causing potential worries of the space becoming a zone for COVID transmissions. The departmental leadership decided to let staff leave after report which avoided the congregation, eased staff anxiety, and improved employee satisfaction. While the immediate purpose for management to make this decision was to avoid COVID transmissions, it did impact several other aspects such as staff being able to get home earlier than usual. Even a small difference like 15-20 minutes mattered to the staff working 12-hour shifts, especially in a busy COVID environment. An unintended consequence of this change was the change in expectation of some staff to leave early even after COVID surges, and adjusting back to the previous model.

Our tendency is to react to the events that are visible to us, instead of addressing the underlying layers and expanded influences coproducing the events (Kim, 1999). “Each level down the iceberg offers a deeper understanding of the system being examined as well as increased leverage for changing it” noted Cunliff (n.d., para. 9). The model proposes that “one should search in the environment or “containing systems” for patterns and trends which are

influenced by underlying structures (patterns of patterns) which are informed by mental models/mindsets" noted Starr (2018).

Following this concentric design approach, Figure 7 is a model of the containing systems and sub-systems in which the Center City division of Jefferson Health's respiratory therapy department may be understood. While in some institutions, Respiratory Therapy reports to non-nursing departments, at Jefferson Health, the Nursing Department is the containing system which means there are explicit and implicit influences from Nursing on the function of Respiratory Therapy. And as the Nursing Department's containing system is the Hospital, the hospital's policies influence explicitly and tacitly how the Nursing Department provides oversight to Respiratory Therapy. And so on in the expansionist systems framework.

Figure 7. Jefferson Health Containing and Sub-systems



The Respiratory Therapy department at Thomas Jefferson University Hospitals, Inc. includes the departments at Thomas Jefferson University Hospital (TJUH), Jefferson Hospital of Neuroscience (JHN), Jefferson Methodist Hospital (JMH), Magee Rehabilitation, and outpatient services. Inpatient respiratory therapists are divided into two staffing groups. The first group includes RTs at TJUH, JHN, and Magee. Second is the RTs at JMH. The former group has an obligation to be cross-trained across at least two campuses, or to be specialized in neonatal and pediatric care at TJUH. Those specializing in neonatal and pediatric care are not required to be cross-trained between campuses. While TJUH and JHN are similar in most of the respiratory therapy work, Magee is different since it is an acute rehabilitation. This dissertation focuses on the retention of RTs at the inpatient locations of TJUH, JHN, and Magee.

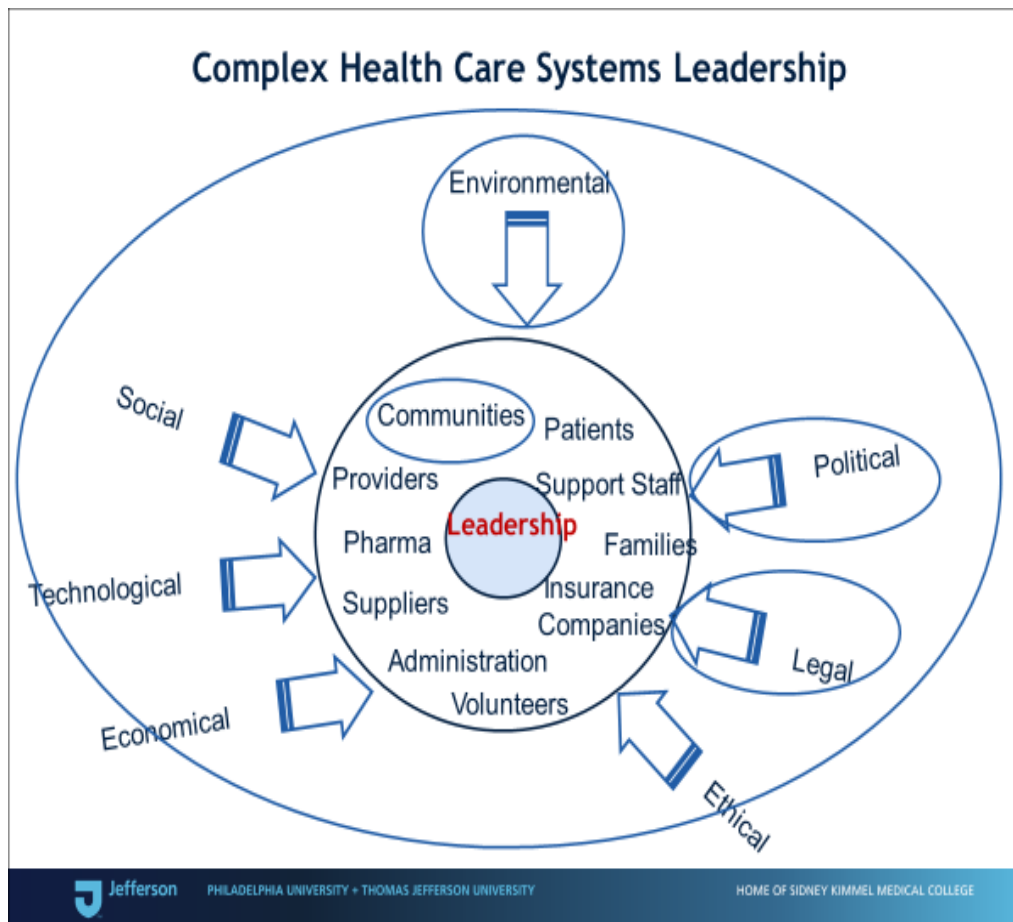
Complex Adaptive and Evolving Systems

Modern complexity theory and complex adaptive systems literature originated from the Santa Fe Institute (Jackson, 2019). Marion (2008) noted, “Complexity theory is the study of the dynamic behaviors of complexly interacting, interdependent, and adaptive agents under the conditions of internal and external pressure” (p. 3). Complex adaptive systems are social (and natural) systems that involve several complexly interacting parts. These are not bound to fixed rules of interaction of their parts but are evolving and changing the rules of their self and organizational development, where they are also called “complex evolving systems” (Jackson, 2008). Often ignored but the properties of complex adaptive systems are emergent and self-organizing (Jackson, 2019). Millions of social and organizational systems around the world are examples.

Healthcare organizations and the subsystems within them may be understood as consisting and operating as complex adaptive systems, which evolve over time (sometimes

referred to as complex evolving systems). As sub-systems within containing systems, some of the major changes in healthcare have been informed directly and indirectly by their containing systems and the broader environment context two examples of which in the United States are the passing of the Medicare Act in 1965 and the Affordable Care Act in 2009. Both legislative Acts created major changes in the functioning of the healthcare system forced by the policy changes. Improving technology and availability of advanced therapies, lifestyle changes such as urban living, processed food consumption, and lack of exercise, change in pharmaceutical industry, increased specialization among clinicians, are some of the factors influencing the overall healthcare environment. Figure 8 (Starr, 2018) presents a systems-view of how leadership within a complex healthcare system is influenced by contextual and containing system forces.

Figure 8. Systems influence of leadership (Starr, 2018).



Emergence of COVID-19 became a lively experience that influenced the functioning of an untold number of complex adaptive systems, where a situation primarily understood as a healthcare crisis soon became a global evolving crisis interacting with and impacting many aspects of life. The drastic change in employment was one of the unintended unpredicted and mostly unexpected characteristics of this complexity. Within healthcare systems, immediate responses to stop the massive staff exodus were commonly managed by increasing compensation such that the increased demand of RTs led to an increase in hourly rates. Agency contracts are as high as three times more than the average RT hourly rate, ranging around \$150 per hour in October, 2021 compared to an average rate of \$37 per hour for fulltime employees. RTs seeking higher income – more per money hour compared to their fulltime positions - could find lucrative assignments locally within driving distance.

Many health institutions facing inadequate RT staffing during the pandemic and its aftermath completed or are completing compensation market analyses, adding additional hourly incentives, and sign-on bonuses to retain and recruit. While this is a national phenomenon, the impact has not been consistent across all healthcare institutions. Some institutions retained staff more than others, and some recruited new staff.

The primary response to RT staff shortage by most healthcare organizations has focused on increasing compensation, e.g., increasing the hourly rate, and offering hourly bonuses and retention bonuses. Local institutions compete by offering more money to retain staff. The mindset underlying this strategy is that of linear economic relationship between staff retention and recruitment, hence the assumption that the approach should primarily be financial. However, this is insufficient: Even though this response may have provided an immediate short-term benefit, it has long-term consequences that are not accounted for, and not even understood at this

time. For example, this practice soon became a spiral which not only impacted budgets but several other known and unknown areas of work. This reductionist approach has not provided significant improvements. Retention of staff is influenced by several other components, often weighing unevenly across the spectrum. Personal and behavioral components are also part of this equation.

An equity review and market adjustment of respiratory therapists was completed in November of 2020. This review was primarily triggered by the high turnover rate of respiratory therapists at several divisions. Center city respiratory therapy department’s turnover rate remained comparatively stable during this time, but the review and adjustment was completed to bring all divisions to the appropriate salary level. Prior to this, several incentives were offered for additional shifts worked by staff. Table 1 shows the annual turnover rates of four (all) inpatient respiratory cost centers at TJUH, JHN, and JMH. As opposed to the popular belief, increase in pay and incentives did not prevent turnover. Responding to the evolving system, an increase in annual turnover is observed in fiscal years (FY) 21 and 22. The reasons for voluntary turnover are listed in Table 1.

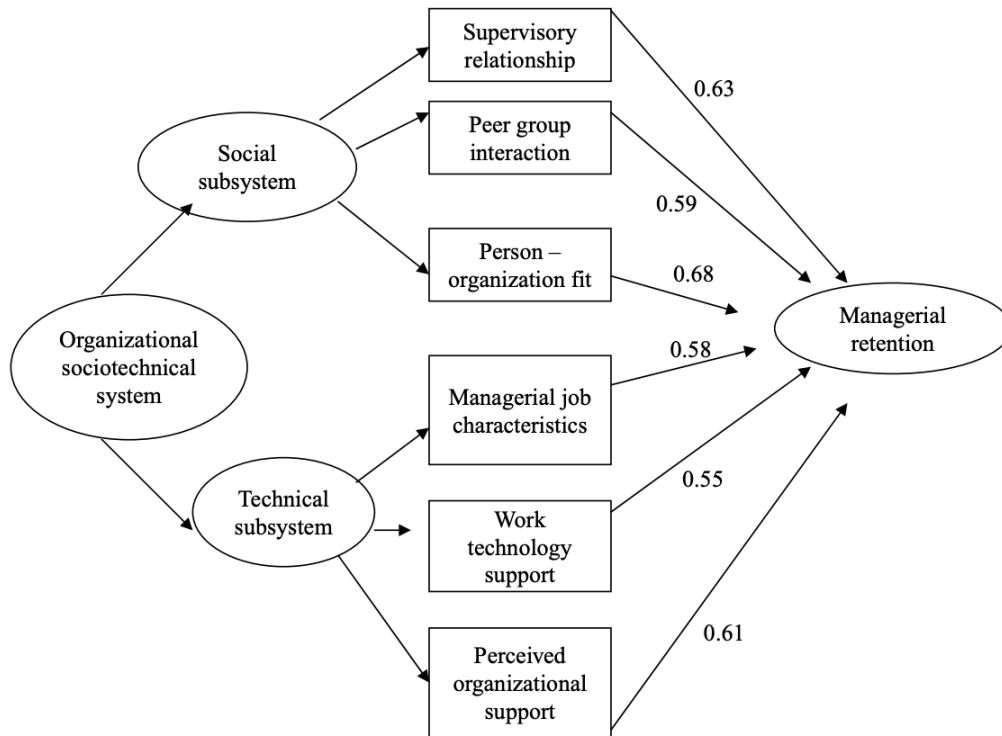
Table 1. Annualized turnover rates of respiratory therapists

Fiscal Year	Date	Annualized Turnover FYTD	Annualized Voluntary Turnover FYTD	Voluntary Termination Reasons
FY 20	6/30/20	4.2%	2.1%	Retirement (2)
FY 21	6/30/21	9.1%	8.1%	Education (1); Retirement (1); Personal reasons (2); Better opportunity (4)
FY 22	6/30/22	10.70%	10.7%	Relocation (2); Retirement (2); Better opportunity (7)

The prevailing conceptions of staff turnover apply a linear model in which retention is caused by or adding up independent elements. Figure 9, for example, presents a linear sequential

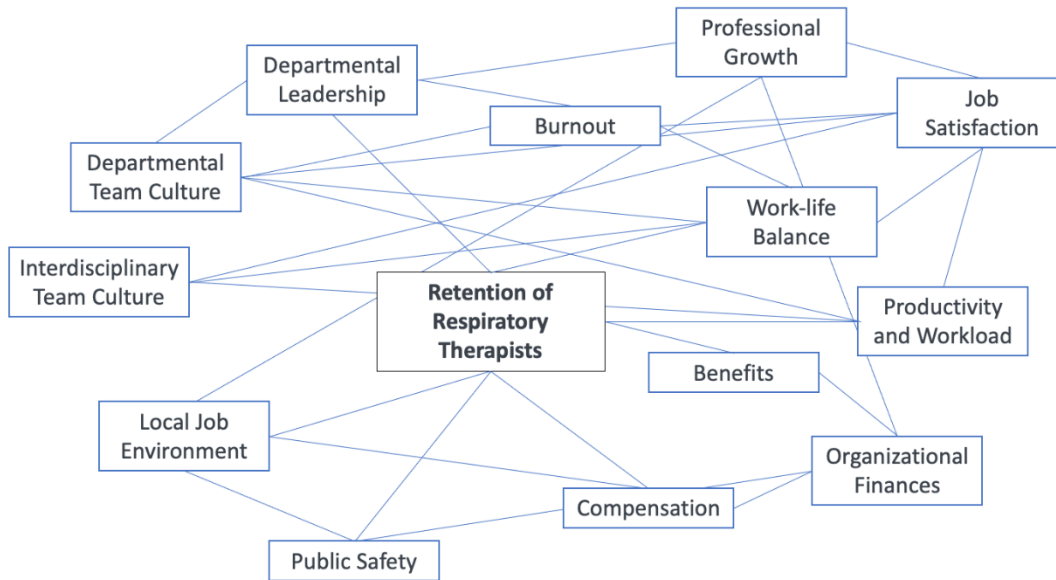
model of employee retention as presented by Ghosh and Sahney (2011, p. 50). In this, six elements contribute such that increasing each will increase retention.

Figure 9. General linear model for impact of STS on managerial retention (Ghosh & Sahney, 2011, p. 50)



Instead of the analytical approach, a systems approach to formulating the problem, including use of systems tools to describe the situation, is suggested. For example, Figure 10 provides a system-model of the influencing sources of retention of respiratory therapists.

Figure 10. Influence diagram on retention of respiratory therapists.



In this model, retention of RTs is described as co-produced by many interacting, interdependent and influencing forces within a particular context. It is difficult in this conception to know what to do to increase retention.

The Cynefin Framework

Organizations are complex systems and should be viewed as a whole and not as a sum of parts because when reduced into parts, an organizational system's central property loses meaning (Starr, 2018). Furthermore, the interactions from external and internal forces affecting organizational systems are not fixed to a set of rules but can change over time and hence organizations are "complex evolving systems" (Jackson, 2003, p. 115). In order to make sense of the changing contexts and their external and internal influences and hence organizational systems, the Cynefin framework was introduced by Snowden and Boone (2007) as a way to address leadership problem solving and decision making (Figures 11 and 12). Known as a sense-making framework, the model proposes that problems and opportunities exist in different contexts: simple, complicated, complex, and chaos. In the middle of these four contexts is

disorder (Kurtz & Snowden, 2003, p. 468). Simple and complicated problems exist in ordered contexts while complex and chaotic challenges are located in unordered contexts.

Figure 11. The Cynefin Framework (Snowden & Boone, 2007)

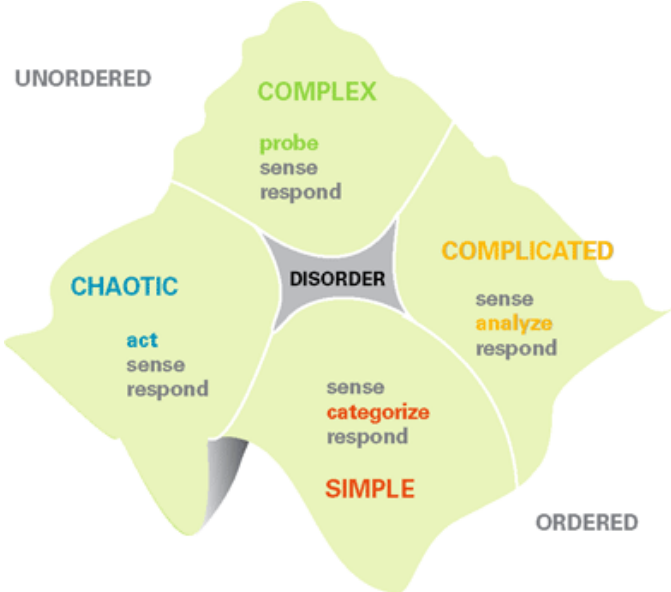
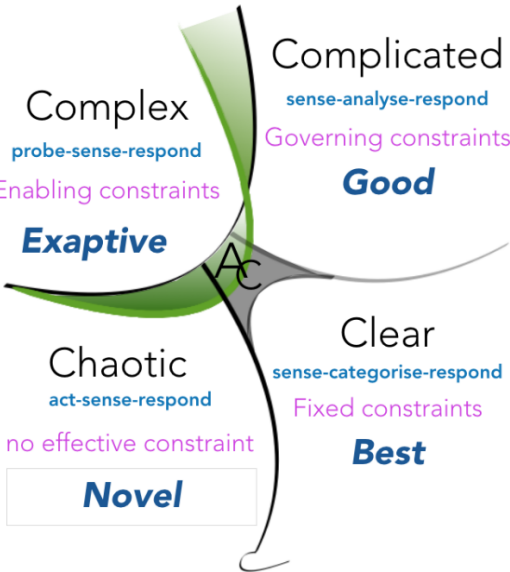


Figure 12. Cynefin Framework (Snowden, 2020).



The framework can be summarized as follows:

Domains: The most recent version of Cynefin describes contexts that broadly range from ordered to unordered but the language describing the domains with them have changed somewhat (Snowden, 2020; Snowden, et. al, 2021). Previously, simple and complicated domains were considered in the ordered context, and complex and chaotic in the unordered context (Snowden & Boone, 2007). In the updated conception, the middle space, formerly known as disorder, is renamed the confused domain, which is defined as the lack of knowing which domain one is in (Snowden, et. al, 2021). Starr (2020) elaborated on the problem differences in the different domains in the Cynefin framework (Table 2). As noted, simple or obvious problems can benefit from best practices; complicated problems benefit from a high level of expertise in a variety of fields; but for complex problems, expertise is insufficient because every problem situation is unique and must be understood as individual.

Table 2. Simple, Complicated and Complex Problem Differences (Starr, 2020)

Simple/Obvious: Follow a Recipe	Complicated: Send a Rocket to the Moon	Complex: Raise a Child
Recipe is essential	Formulae are essential and critical	Formulae have limited application
Recipes are tested to assure easy replication	Sending one rocket increases assurance that the next will be OK	Raising one child provides experience but no assurance of success with the next
No particular expertise is required. But cooking expertise increases success rate	High level of expertise in a variety of fields are necessary for success	Expertise can contribute but is neither necessary nor sufficient to assure success
Recipe produces standardized product or outcome	Rockets are similar in critical ways	Every child is unique and must be understood as an individual
The best recipes give good results every time	There is a high degree of certainty	Uncertainty of outcome remains
Optimistic approach to problem solving is possible	Optimistic approach to problem solving is possible	Optimistic approach to problem solving is possible

Ordered Context: This domain is divided into clear (previously simple) and complicated. In the clear domain, constraints are rigid or fixed, and results are predictable. In the complicated domain, expertise is required. The common approach in the complicated domain is to “first reduce or simplify the problem into small parts in order to determine the root cause then to apply good practices including research and analytic methods that will lead to a solution” (Starr, 2018, p. 14).

Contextual Practices: Practice varies in different Cynefin domains. Clear or simple domains utilizes best practice, a complicated domain uses good practice, and in a complex domain practice is “exaptive” defined as “focused on radical re-purposing of existing capability often through processes that emerge due to the interactions among elements and parts. In the chaotic domain, the approach is to acquire novel practice” (Snowden, et. al., 2021, p. 60). Complex domain is considered a domain of emergence. (Snowden & Boone, 2007). To explain the context further, Snowden and Boone (2007) use the analogy of a Ferrari and a Brazilian rain forest. Ferrari is in the complicated domain where an expert mechanic can take it apart and reassemble, whereas a rain forest is always constantly emerging with changes like extinction of species, changes in water routes, weather pattern changes, and much more.

Framework: Cynefin is a framework that allows leaders to determine which context they are in, and to determine which methods or approaches for decision making should be adapted (Snowden, et. al., 2021). The context and the type of problem is important for the leader to understand, hence fundamentally changing the problem-solving approach (Starr, 2018). Starr (2018) elaborates on the problem characteristics in differing contexts (Table 3). Being aware of the context and domains is important for leaders. A leader’s response to a problem is dependent

on being aware of the domains and its boundaries. (Snowden, et. al., 2021). Table 3 is a detailed list of the characteristics of problems in complicated and complex domains.

Table 3. Problem Characteristics in Differing Contexts (Starr, 2018, p. 21).

	Context	
	Ordered	Unordered
Characteristics	Complicated	Complex
Structure and Order	Well-Structured and Predictable: Leadership problems can be clearly defined, best choices identified, and solutions can be implemented.	Poorly Structured and Messy: Leadership problems may not be defined in advance; only afterward. Events and influences are probabilistic, and solutions are revealed by discovery.
Mode of Thinking	Analytic/Analysis: An explanation of leadership is derived from an explanation of the role of deconstructed parts that add up to leadership.	Systemic/Systems: An explanation of leadership is derived from explaining interactions within and between the organizational system from which it emerges.
Explanation of Cause	Cause and Effect: Leadership is context (environmental)-free, linear, additive with predictable effects (outcomes) following from well-defined causes.	Producer-Product: Leadership is context (environmental)-full/rich, non-linear, non-proportional, not predictable with co-produced and emergent characteristics.
Approach to Problems	Reductionism: The belief that leadership is in the person and can be reduced to a research-based set of traits, styles, behaviors, situations, and core competencies.	Expansionism: The belief that leadership is dynamic and emerges from the interaction of many influencing elements including from external/containing systems.
Relationships of Elements	Linearity and Proportionality: A change to one element of the input/cause creates a direct change in the output/effect at a constant rate that is predictable and sequential.	Nonlinearity and Nonproportionality: Changes made to the input/cause are not proportional to the output/effects and may appear unpredictable, nonlinear and counterintuitive.
Methodology and Reasoning	Research: Science and evidence-based thinking using inductive and deductive reasoning can solve a problem by generating a choice that meets the objectives and creates an optimal solution.	Design: Design, creativity and innovation using abductive reasoning can lead to emergence of a novel configuration that can dissolve the problem and create conditions where the problem cannot occur.
Leadership Topics	Conventional knowledge and practices including traits, skills, competencies, styles, behaviors and other analytic and linear models.	Complexity-informed knowledge and practices including multiple systems approaches, complexity leadership and

		other emerging non-linear models and practices
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Leadership response in domains: Cynefin framework proposes the following responses in each context. In the simple or clear context, the response is “sense-categorize-respond.” (Snowden, 2020). Leaders “assess the facts of the situation, categorize them, and then base their response on established practice.” (Snowden & Boone, 2007, para. 8). If a hospital runs out of available ventilators, the hospital will respond by reaching out to a rental company to rent more ventilators. The decision is straightforward and can be easily made.

In the complicated domain, the response is “sense-analyze-respond.” (Snowden, 2020). Known as the domain of “known unknowns” this domain “may contain multiple right answers, and though there is a clear relationship between cause and effect, not everyone can see it” (Snowden & Boone, 2007, para. 14). In this scenario, the hospital runs out of ventilators but so do other local hospitals. Multiple factors are involved in making the decision which include approaching other rental companies, making long-term commitments, renting for a higher price, creating contracts with new rental companies, etc. Multiple experts, in finance, supply chain, departmental leaders, etc., are involved in the decisions making.

In the complex domain, social systems are emergent, where leadership is an emergent property of the system. Leaders follow a “probe-sense-respond” approach. (Snowden, 2020). These leaders “create probes to make the patterns or potential patterns more visible before we take any action” (Kurtz & Snowden, 2003, p. 469). Probing to understand the pattern should happen in different levels of the organization because patterns are “emergent properties of the interactions of the various agents” (Snowden, 2002, p. 16). The magnitude of the situation will

vary based on the type of organization, mostly dependent on the interacting parts and the hidden or unknown culture, which cannot be replicated in organizational documents.

Severe ventilator storage in any institution is a major crisis. Hospitals have a limited number of different types of ventilators. These ventilators are different in its abilities and functionalities. During the first COVID surge, the use of ventilators was high causing health systems to develop concerns over available inventory. Availability of critical care beds was also a concern since most acute patients requiring ventilator support are primarily admitted and cared for in sophisticated ICUs. Lack of personnel was also a concern. These ICU beds usually call for a higher staff-to-patient ratio. Increasing the number of ICU beds without appropriate concerns about other factors (staffing, equipment, supply) is catastrophic. At Jefferson, this led to a multifocal approach to handling the crisis, several of them are listed below:

Definition and deployment: Importance to identify the type of ventilator and a deployment plan according to this was developed. (Juby, et. al, 2020).

Allocation: Developed a pathway for appropriate allocation and use of ventilator resources in surge conditions. (Gekas, et. al., 2020)

Multi-patient use system design: Designed a system that could ventilator multiple patients using a single source. (Naopli, et. al., 2020).

The responses above are some of several emergent aspects of managing COVID surge and ventilator shortage at Jefferson Health. Along with these, an ethical decision-making clinical group was formed to manage and allocate ventilator resources during extreme situations. In these situations, expert opinion is not providing the solution. Instead, leaders continue to try to understand multiple perspectives on the nature of the system by standing still but paying attention at the same time. (Kurtz & Snowden, 2003).

Jackson (2019) agrees with Snowden and Boone (2007) that a probe, sense, and respond approach in managing challenges in complex contexts is appropriate. A leader who discerns an unordered or unstructured problem in a complex context is directed by the Cynefin model to probe (attempt small experiments) a process to unravel the hidden or potential patterns that will allow the leader to better sense/understand the system. The goal is to apply an appropriate intervention strategy that will enable a shift of domains from the unordered (complex) to the ordered (complicated). This shift allows (complex) undesirable patterns to be destabilized, and space to be created for more desirable patterns (complicated) to emerge and become stabilized (Kurtz & Snowden, 2007). Examples of a methodology and tools for intervening (addressing) a complex problem is presented in Chapter 3 of this dissertation.

In the chaotic domain, the response is “act-sense-respond” (Snowden, 2020). This domain lacks visible or identifiable patterns and is filled with turbulence. The leader will need to act instead of waiting for observable patterns, because the primary concern of the leader is to pause the bleeding, and to examine the reaction to the intervention for further interventions, to limit and reduce turbulence. (Snowden & Boone, 2003; Kurtz & Snowden, 2007). During a lack of ventilator, the organization will take measures like ethical decision making for allocation of the ventilator or use of continuous manual ventilation using human volunteers.

(RescueVentilation.com, n.d.). Figure 13 from the Cynefin framework field guide shows a similar depiction of the ventilator crisis placed in the different domains as they emerged.

Figure 13. Cynefin framework for respiratory support services (Snowden & Rancati, 2021, p. 41).

Complex

Place in this corner all the solutions/decisions for which several options are possible. Set up parallel, independent experiments and monitor responses.

Adjust protocols to assign beds and ventilators
Repurpose scuba masks using 3D printed parts

Complicated

Place in this corner all the solutions/decisions that require deeper analysis and the help of experts. Extrapolate from good practices.

Redesign ventilators to increase their capacity

Confused

Place the challenge here.



lack of
equipment

Use anything at hand to remedy the lack of equipment

Chaotic

Place in this corner all the responses that need immediate action but have no clear outcome or look far-fetched. Exapt or re-purpose available resources.

Order more ventilators

Clear

Place in this corner all self-evident responses to the challenges. Use tried and true methods.

Navigating Complex Systems

Complex social systems are evolving, where leadership is an emergent property of the system. Leaders, who follow the Cynefin framework in problem-solving and decision-making, probe, sense, and respond in complex environments. These leaders “create probes to make the patterns or potential patterns more visible before we take any action” (Kurtz & Snowden, 2003, p. 469). Probing to understand the pattern should happen by systems approach aware teams (leaders and team members) in different levels of the organization because patterns are “emergent properties of the interactions of the various agents” (Snowden, 2002, p. 16). The magnitude of the situation will vary based on the type of organization, mostly dependent on the interacting parts and the hidden or unknown culture, which cannot be replicated in organizational documents.

As the functioning and productivity of social systems depend on the interactions of the parts of system, most of which are people, the relationships between the leader and staff and the multiple layers of leadership are crucial. Indeed, as emergent patterns are best identified by the people at the frontline, leaders within large organizations must be interconnected beyond the prevailing hierarchical structures; leaders need multiple pathways with colleagues to ensure communication of timely and accurate problem identification and problem formulation. Unfortunately, leaders do not commonly adopt a systems approach; they may instead rely on traditional linear hierarchical (top-down and bottom-up) pathways which can fail to provide information about complex problems. Lord (2008) noted, moreover, the isolation of top layers of leadership from critical environments and that Leaders should connect with the frontline staff to connect the variables to make the appropriate decision. This strategy follows from a systems approach; it is rare in the prevailing analytic approach to organizational leadership.

Relying on linear and directive sequences that are understood through linear structures or previous knowledge, is not enough in the complex adaptive system. Accepting that ‘one size fits all’ and ‘we have always done it this way’ conflict with and obstruct the complex adaptive environment. Hence, probing is extremely important. The emergence and appreciation of new patterns characterize complex adaptive systems. Once the patterns are identified, the leader will “sense those patterns and respond by stabilizing those patterns that we find desirable, by destabilizing those we do not want, and by seeding the space so that patterns we want are more likely to emerge” (Kurtz & Snowden, p. 469).

Leadership in a complex domain is, Snowden (2002) argued, “based on natural authority and respect, but it is not democratic; it is matriarchal or patriarchal.” Leaders and leadership patterns emerge and are beyond hierarchies and organizational structures. This suggests that the

culture and mindset of the organizations must evolve and match functioning in the complex environment, and support the relationships between the interacting parts. The role of leaders in these kinds of contexts is to foster interaction, interdependency, and tension within the interacting parts (Uhl-Bien, Marion, & McKelvey, 2008). Relationships are recognized as a key component of a system, and hence much value is given to “local relationships and interdependencies among organizational members” (Jordan, Lanham, Crabtree, Nutting, Miller, Stange, & McDaniel, 2009).

Heifetz, Grashow, and Linsky (2009) differentiate technical problems and adaptive problems. Technical problems, even when they are challenging and critically important, have known solutions that can be implemented by the current knowledge and expertise. This type of problem is very similar to the meaning and scenarios in a complicated domain in the Cynefin framework. However, adaptive challenges for Heifetz and colleagues are similar to complex challenges for Snowden and colleagues: “Adaptive challenges can only be addressed through changes in people’s priorities, beliefs, habits, and loyalties” (Heifetz, et. al., 2009, p. 19). Comparing this to Kim’s (1999) iceberg model, adaptive challenges refer to these are the deeper layers of the iceberg, specifically the mental models. Table 4 provides a description of the differences between technical problems and adaptive challenges.

Table 4. Distinguishing technical problems and adaptive challenges (Heifetz, et.al., 2009, p. 20)

Kind of challenge	Problem definition	Solution	Locus of work
Technical	Clear	Clear	Authority
Technical and adaptive	Clear	Requires learning	Authority and stakeholders
Adaptive	Requires learning	Requires learning	Stakeholders

In an adaptive challenge, the locus of work shifts from authority to stakeholders. Heifetz et. al. (2009) proposed a three-step process to navigate complex adaptive systems. They are:

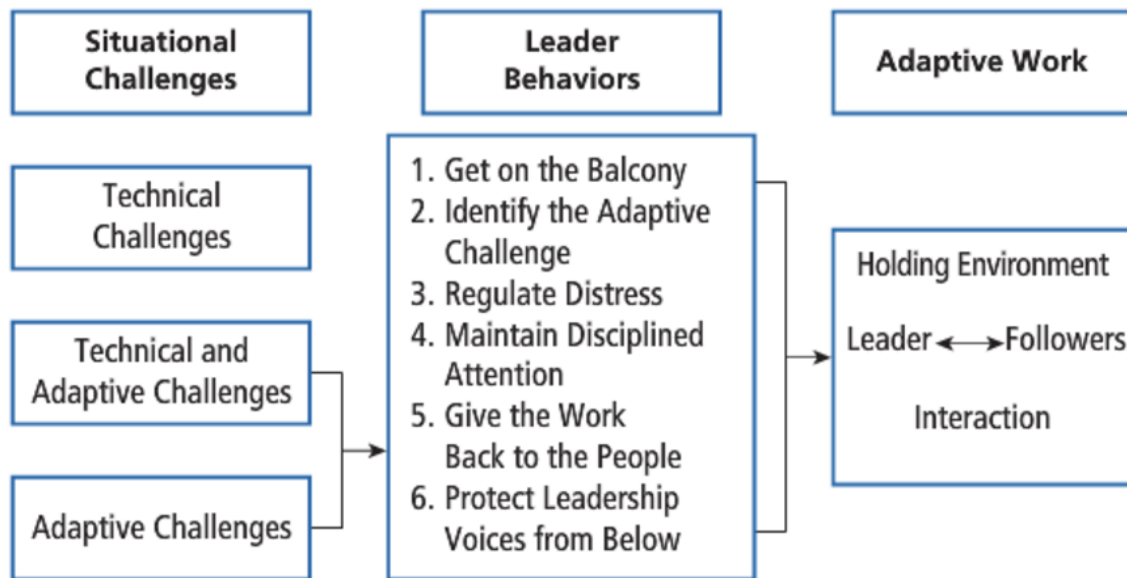
Observing events and patterns. Objective observation of events and patterns is important but it is also not easy. People view events differently based on “their previous experiences and unique perspectives.” The leader’s attempt is to get as objective as possible (Heifetz et. al., 2009, p. 32)

Interpretation of the observations: Interpretation is hypothesizing the observations. It may not be always correct and may cause tension in the system when shared with other because of the interpretations of the same event being different from person to person.

Interventions based on observations and interpretations: Designing interventions that are aligned with the purpose of the organization, and effectively bringing them to the forefront.

In all three stages, leaders need to identify both internal and external stakeholders, engage with the stakeholders regarding the adaptive challenge at hand, and work together in designing the solutions. Stakeholders are not limited to any particular level of the hierarchy, but depending on the hierarchical structure, leaders may find barriers to effectively engaging. Strengthening relationships, expanding informal authority, orchestrating conflicts, communicating the purposes, and much more (Heifetz, et. al., 2009). Northouse (2019) presented a summary diagram (Figure 14) of the Adaptive Leadership Model including specific actions leaders can take when confronting adaptive challenges and situations with mixed adaptive and technical issues.

Figure 14. Adaptive Leadership Model (from Northouse, 2019)



Senge (1990) identified three areas where a leader can influence people using the metaphor of the Iceberg Model developed by Kim (1999), namely events, patterns of behavior, and systemic structure. Organizations are usually reactive and focus on the first two areas whereas leaders with a systems thinking mindset look at all three levels and inspire their organizations to do the same.

During the first COVID surge, respiratory departments at Jefferson health designed a shared document to capture ventilator supply availability at all hospitals. The request for this came from senior administration for internal and external needs. Internally, leadership needed to be aware of the availability of devices at each location. Externally, ventilator availability was one of several other metrics required to be submitted to federal and state governments. Divisional leaders had concerns about bringing this data to the public since all locations were trying their best to maintain their supply. There was always a potential for decisions from higher authorities requiring the ventilators to be transported to other locations, and the devices not being available while these locations experience surge. Figure 15 depicts a horizontal iceberg view during this

time, and Figure 16 depicts a top-down view of the events providing a non-linear interconnected systems viewpoint.

Figure 15. Ventilator supply management: Iceberg view

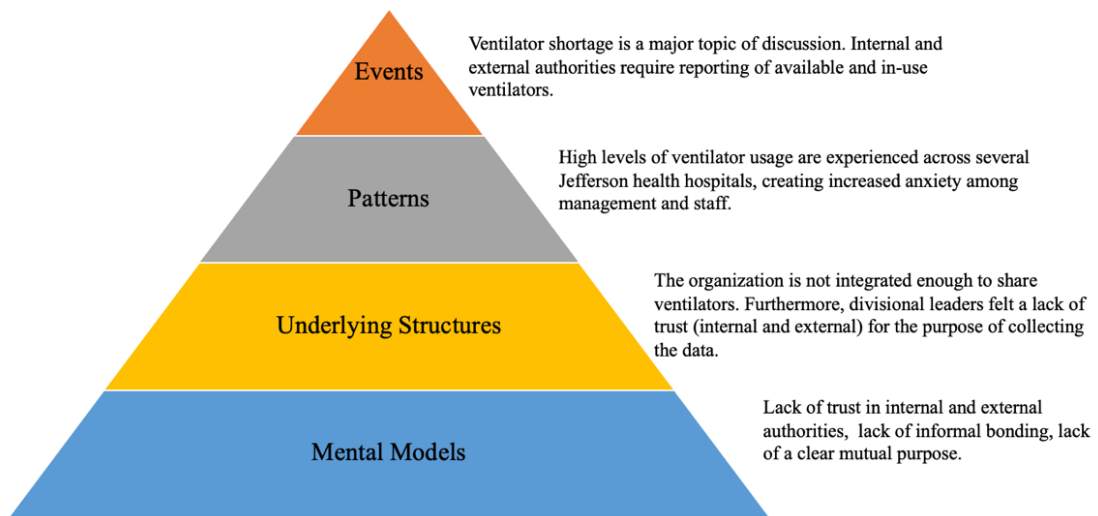
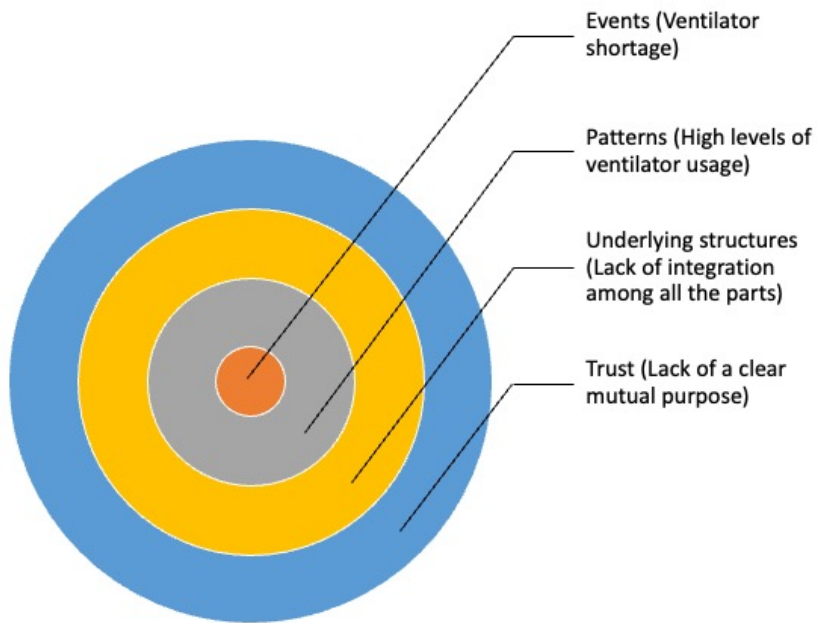


Figure 16. Ventilator supply management: Iceberg view from the top



Developing trust among the divisional leaders was a major step in overcoming this barrier, where all divisions agreed on discussing and supporting each other as the challenge emerged and evolved. During daily calls, the situation was analyzed. All stakeholders engaged in working towards the same purpose – to have enough inventory of ventilators at all locations. For this, additional devices were rented, devices and disposable supplies were transported between divisions, often by operational leaders in their vehicles, an open line of communication to support each other regardless of regular work hours was formed, and much more.

Understanding the relationship between structure and behavior is a starting point to understanding how systems work. (Meadows, 2008). Ackoff (1999a) identified three steps in the process of systems thinking: One is to “Identify a containing whole (system) of which the thing to be explained is a part.” Second is to “Explain the behavior or properties of the containing whole.” Third is to “Then explain the behavior or properties of the thing to be explained in terms of its *role (s) or function (s)* within its containing whole” (p. 17)

While Ackoff (1999) explained the systems approach as the opposite of analysis, he does not diminish the value of analysis. He explains the need for analysis to know “how things work” whereas in the systems approach, its synthesis which focuses on “function,” or “why things operate as they do.” In a system, the leader is looking for synthesis and not analysis. Analysis is "an explanation of the whole derived from the explanation of its parts" whereas synthesis is "an explanation of the whole derived from explaining the role of the system in the larger system of which it is a part" (Starr, 2018, p. 16). In systems thinking, both analysis and synthesis are important.

Multiloop Nonlinear Feedback System

The prevailing mindset within management is characterized primarily by linear thinking which supports deconstructing and analyzing problems in search of root causes for observed outcomes. The expectation and prediction that increasing pay to individual workers will control staff retention is such an example of linear thinking. Figure 17 denotes this argument compared to Figure 18 which denotes a single loop feedback system.

Figure 17. Linear predictive causal relationship

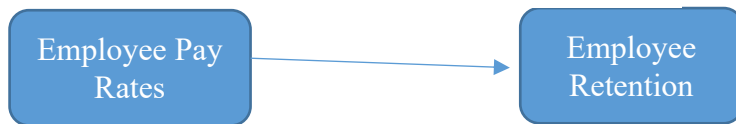


Figure 18. Single loop feedback system on employee retention

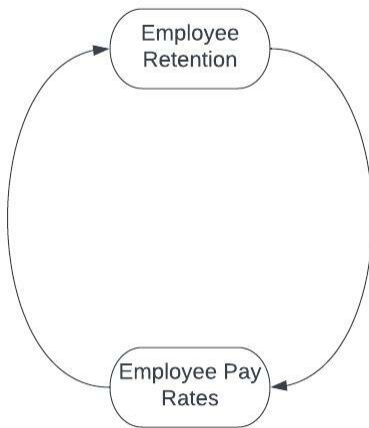


Figure 17 argues that pay rate will directly lead to retention. Figure 18 argues that pay rate and retention are in a circular relationship wherein retention influences pay rates. An ever-evolving world with global organizations and interconnectedness requires the mindset to shift and adapt to the nonlinear nature of the organizations where observed and unobserved outcomes are coproduced and emerge, often surprisingly. Feedback is the flow of information of different

kinds between the interacting parts of the system. These can be negative and positive, and should help or hurt the system (Dutta, 2017). In complex systems, cause and effect are non-proportional and nonlinear. In nonlinear systems, “whole is the property of the interaction of the parts” of the system and not the addition of the parts (Gharajedaghi, 2011). Figure 19 is a casual loop diagram that helps awareness, and understanding that an organizational system operates with this kind of relationship (Gharajedaghi, 2011). Figure 19 presents an expanded depiction of retention with the positive and negative relationships that emerge from interactions.

Figure 19. Employee retention influence diagram

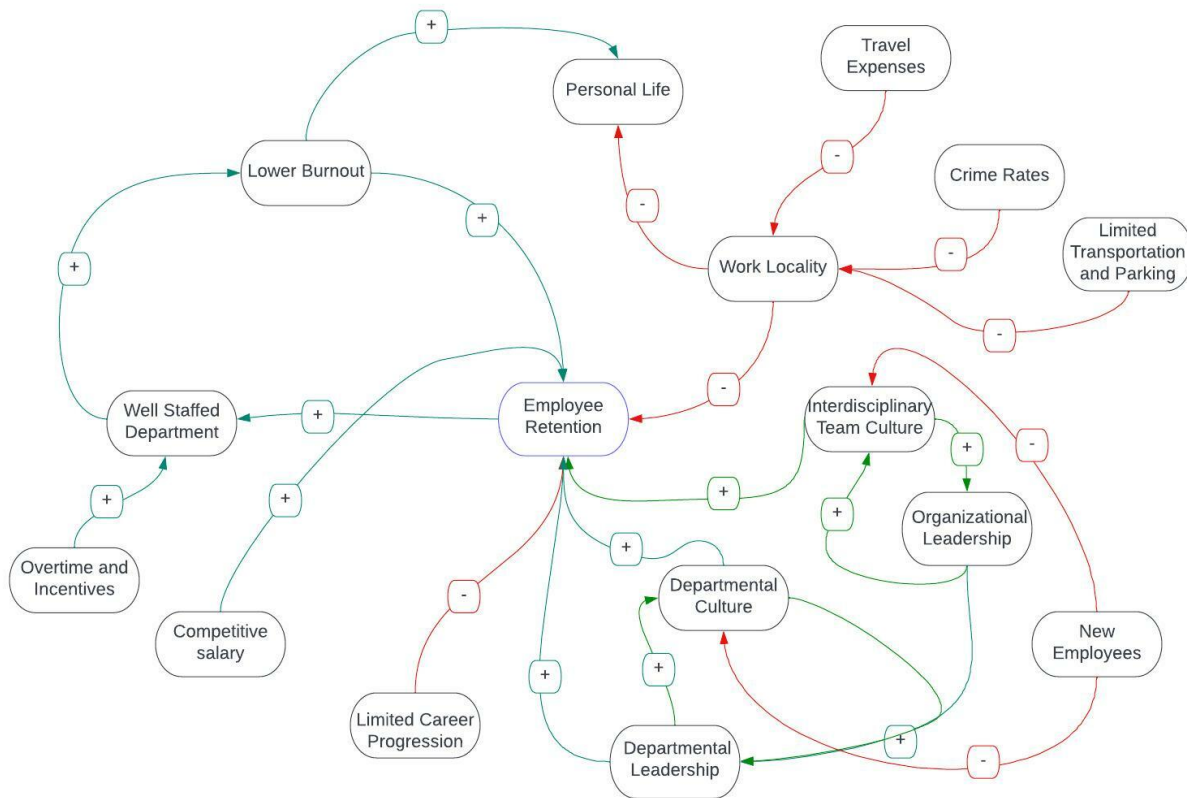


Figure 19 is an influence diagram that highlights that retention of employees at TJUH, an inner-city academic medical center in Philadelphia, concerns more than salary. One of the issues of importance to employees in the past year is the availability of parking, especially for workers coming in and leaving during early morning and late-night hours. Increased crime rates,

homelessness, and other conditions giving the perception of the city being unsafe have created uneasiness among employees in taking public transportation. Added to this issue are the limited parking options due to construction, as well as increasing parking rates, all impacting employee retention.

Learning and Adaptation

Feedback loops are communication channels that can provide information, meaning, and understanding; important elements for learning and adaptation. Senge (2006) points out three aspects of team learning: insightful thought about complex problems by the team (cognition), innovative and coordinated action (performance), and the role of team members on other teams (relationships). As described by Snowden and Boone (2007), for a complex problem, there are no experts with all the answers. Rather, what is beneficial is to develop and access a network, a team of experts who interact and from which emerges viable options. Individuals are unable to gain enough knowledge to know all the answers in complex situations (Schein & Schein, 2018). Learning teams are useful in formulating complex problems by exploring the experience of team members. Each member may have a different experience and interpretation of the problem (Senge, 2006). Creating such dialogue and discussion is essential in social systems. Strong networks share information, generate knowledge, and learn from mistakes – all of which is essential in navigating complex problems (Jackson, 2003).

Learning and adaptation occur in clinical and operational environments. In the clinical environment, team members rely on each other's expertise in managing the patient. A physician, even though trained in the management of lungs, will consult the respiratory therapists for managing settings on the respiratory devices. In the operational environment, team members and leaders gain valuable feedback on the ongoing changes in the environment impacting the experience of the employees. Contextual and environmental problems such as the closure of a

parking lot, could be minimized as a simple problem because it is not clinical. However, unless appropriate arrangements to equate the loss of parking spaces with meaningful experiences are made, the impact is meaningful. Staff would have to leave for work earlier, which may cause issues with social activities such as babysitting and sleep hours. In some cases, there is a financial impact where employees would have to pay for additional social services causing personal financial issues.

Both clinical and operational issues generate feedback because learning and adaptation are involved. Hospitals have online feedback systems, such as OnPoint reporting and feedback system, to report events that require follow-up actions from responsible parties. However, the design and function is not always systemic: OnPoint, for example, is limited to clinical care even though some operational issues could be reported such as elevators being backed-up or too crowded during start and end of shifts. Such systems are meant to provide a channel to alert responsible parties to do investigation, make appropriate changes when necessary, and provide feedback. In a comprehensive social system, the experience of the staff at the workplace would be recognized as influenced by many other factors (see Figure 11) and would be included as relevant to information technologies (such as OnPoint) used for learning and adaptation.

In complex contexts, leadership characteristics become an extremely important component of problem formulation, intervention, and organizational performance (Starr, 2020a; 2020b). Relations with staff, adequate and effective channels of communication, and a systems mindset regarding clinical and operational problems are examples of challenges. These leaders may not have the authority to make changes to some of the issues, like parking or crime rates, but their support is necessary. For example, some departments may mandate employees to clock in and out at one or two specific locations whereas some departments allow it to be done at any

such station. Manager discretion allowing such options will improve employee morale. At TJUH respiratory therapy, the staff is allowed to clock in at any station on the campus. This information is gathered only through ongoing communication with staff. Often, these are informal talks and discussions during the lunch hour or other random times.

Repeatability

Each social system is unique: Universal solutions or rules cannot be applied broadly in complex contexts. Dutta (2017) argues that context plays a very important role in real-life situations, thereby limiting the ability to replicate a solution that worked elsewhere. For e.g., health systems are heavily impacted by the external environment. Multiple factors impact the health outcomes of the community, over which the hospitals have little or no control. Such examples are the rate of education and availability of healthy food choices. These factors do not change for long periods. Even though certain problems can be identified between similar communities in neighboring cities, each is distinct. Hence, replicating a program that is effective in one system will not work in another. Each system needs to learn and adapt to the existing environment.

Several components in the influence diagram (Figure 15) are specific to the organization and cannot be replicated. Clinical settings and personnel vary between units and hospitals. Leadership behavior especially among the physician leader in the unit is a key component, along with the culture of the organization. Some units allow clinicians to practice at the highest level of their license whereas some limit it. These are specific to unit or hospital culture, and not due to regulatory or compliance issues. The involvement of departmental leaders to advocate for clinicians to practice at their highest ability is important, but it also requires an engaged workforce willing to participate in such a change. Disengaged clinicians may limit their

engagement in the completion of tasks and orders, which will become counterproductive. The role of departmental leadership is to bridge the gap between both.

Suboptimal Performance

Improving the performance of a specific part or subsystem in the complex system will not bring the expected improvement to the whole and may unintentionally reduce the overall performance of the system. (Heylighen, 1992). This is a caution for traditional management which focuses on improving the functioning of individual parts. In the case of ventilator supply management discussed above, increasing the ventilator inventory will not solve the challenge. Staffing, acute care beds, disposable supplies, organizational finances, and other factors are important in the discussion. From a financial standpoint, appropriate allocation of funds for newer ventilators and newer acute care beds are both factors to be considered, along with several others. If the organization focuses on improving the availability of the ventilator fleet, it will struggle to find the equilibrium to manage other aspects that require the same resources.

Purpose of Research

The prevailing approach to address the challenges of retention of qualified employees in health care generally and respiratory therapy specifically are reduced to the availability of open positions, and adjusting pay rates (temporary and permanent). But such an assessment is premature, naïve, and does not consider the characteristics and influences from the containing system, and the many elements within the problematic organizational system or their interdependencies and interactions. These will be addressed using systems thinking and the methodologies and tools informed by this approach to problem formulation.

Research Questions

This dissertation will address the following research questions:

1. When the challenge of respiratory therapy staff retention is formulated as a complex systems problem, what differences in understanding emerge compared to the prevailing analytic approach of problem formulation?

2. When the challenge of respiratory therapy staff retention is addressed using systems-thinking and design-thinking methodologies and tools, what outcomes and implications emerge compared to applying analytic and research methodologies and tools, the prevailing approach of problem solving?

Research Audience

The respiratory care profession is comparatively small. Large-scale studies exploring effective retention strategies, compared to physicians and nursing, are rare. This dissertation, consequently, is directed primarily for the leaders in respiratory care, and the senior leaders in respiratory therapy departments who report to. RT departments who report to nursing, or to a hospital operational leader managing multiple non-nursing departments will also find value in this research.

CHAPTER 2

LITERATURE REVIEW

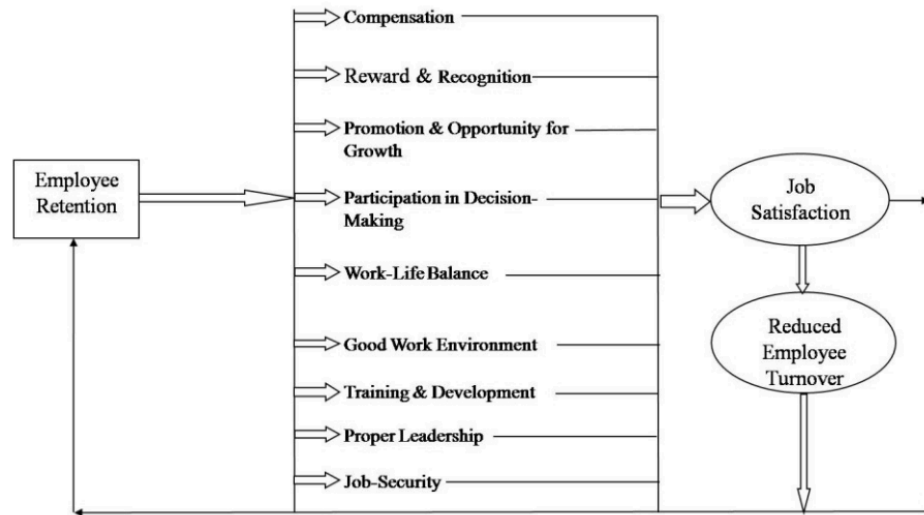
Employee retention, the ability of an organization to retain its employees, is an important metric for organizations. This has been an important topic in organizations following the emergence of the great resignation that was coproduced by the emergence of the COVID-19 global pandemic. In manager meetings, often the point of discussion around employee retention primarily (or linearly) is connected to the cost of orientation and training for new hires, often diminishing the issue. Despite this being a topic of interest, the common approach in organizations is reductionist. A usual response to increased turnover is directly connected to some type of increased compensation, either as a market adjustment of salaries, incentives, bonuses, etc. This literature review focuses on the current literature on employee retention, and employee retention literature on healthcare workers, followed by literature on resolving problems from systems thinking perspective.

Employee Retention Literature

Employee retention and job satisfaction model

Das and Baruah (2013) conducted a review of literature which identified the following factors that will contribute to job satisfaction: compensation, rewards and recognition, promotion and opportunity for growth, participation in decision making, work-life balance, work environment, training and development, leadership, and job security. These factors were identified from 30 published articles. Years of publication ranged from 1989 to 2009. Based on these factors, an employee retention and job satisfaction model was developed (Figure 20).

Figure 20. Employee retention and job satisfaction model (Das & Baruah, 2013, p. 14).



Based on this model, employee retention produces eight factors that lead to job satisfaction and then lower turnover which produces a feedback loop to retention although the interconnectedness of these factors and the effects of the external environment, and context are not specified.

Determinants of employee retention

Bharath (2021) identified determinants of employee retention from available literature which are compensation, supportive work environment, social support, professional and career development opportunities, and some other less studied factors. The following factors were suggested as “work–life balance, well-being, treatment of superiors and peers, avoidance, fatigue, role stress, inability and lack of competence” factors needing to be addressed by health-care organizations (Bharath, 2021, p. 12). The study does not refer to the interrelationships of the different determinants, context, internal and external stakeholders, etc.

Griffeth, Hom, and Gaertner (2000) conducted a meta-analysis of employee turnover literature, as a follow-up to their earlier meta-analysis. Table 5 listed major predictors and some details associated with it, excluding the statistical correlation between the parts discussed. The list below categorizes predictors into components, but does not discuss the relationship between

the predictors. Much of the research is focused on using the below themes as predictors for employee turnover.

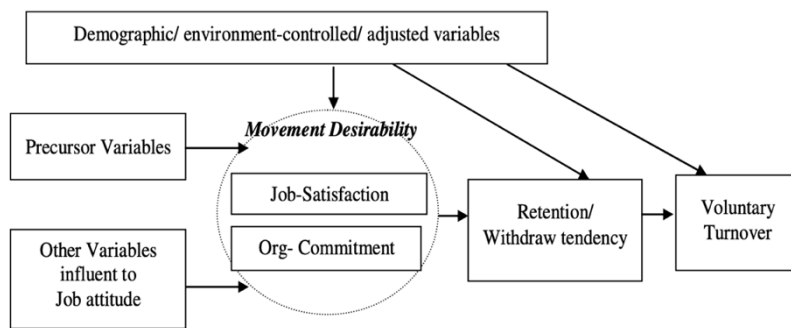
Table 5. Employee turnover predictors (Griffeth, et.al., 2000, p. 479-480).

Predictors	Details
Personal Characteristics	Cognitive Ability, education, training, marital status, kinship responsibilities, children
Satisfaction with Overall Job and Job Facets	Compensation, leadership, teamwork, team culture, stress
Other dimensions	Promotional chances, pay, pay satisfaction, distributive justice, job scope
External environment	Alternative job opportunities, Comparison of alternatives with present job
Behavioral Predictors	Lateness, absences, performance
Cognitions and Behaviors about the Withdrawal Process	Organizational commitment, job search intentions, job search behaviors, withdrawal cognitions, intention to quit

Employee turnover model

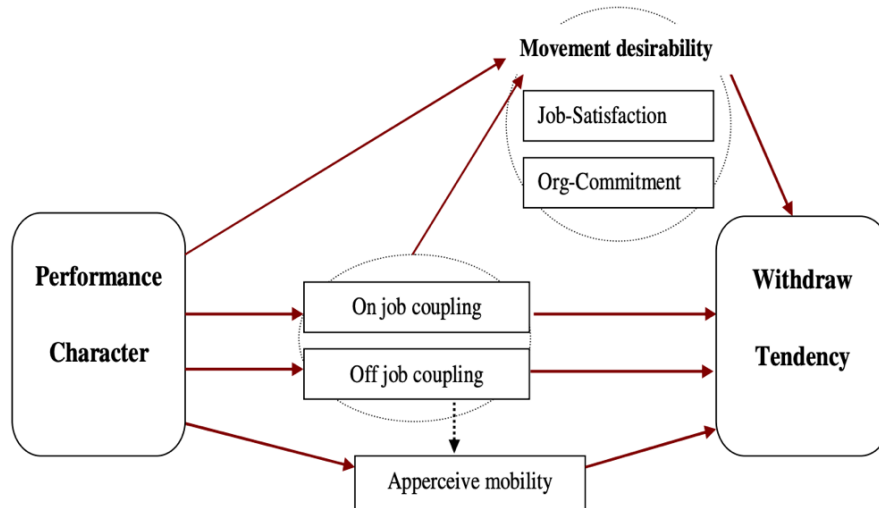
Zheng, Sharan and Tao (2010) adapted the traditional turnover model by Griffeth et.al. (2000) in figure 21. This is another linear model to predict employee turnover. This study also, compared to the previous studies mentioned above, does not refer to the interrelationships of the different determinants, context, internal and external stakeholders, etc.

Figure 21. Employee turnover model adapted from Griffith, et. al., (2000). (Zheng, et. al., 2010, p. 4150).



Two more linear models are cited by Zheng et.al. (2010) leading to the development of the Performance-Withdraw Tendency Model by which also lacks a systems view (Figure 22).

Figure 22. The proposed performance-withdraw tendency model (Zheng, et. al., 2010, p. 4156).



‘Whole-of-Person’ retention improvement framework

Cosgrave (2020) proposed ‘Whole-of-Person’ Retention Improvement Framework as a response to address healthcare employee retention in rural areas. The framework has three domains: “Workplace/Organizational, Role/Career and Community/Place.” (Cosgrave, 2020, p. 4). These domains are preconditions. The workplace/organizational domain refers to the environment that the employee is working in. This includes all aspects like relationship with the manager, team work, work culture, etc. Role/career domain refers to career development and progression, opportunities, etc. Community/Place domain refers to the involvement of the community involved in recruitment and retention and experiencing a sense of belonging. The individual is in the middle of this framework (Figure 23). (Cosgrave, 2020). “The dotted lines between signify the interrelatedness and porous nature of the division between the three domains.” (Cosgrave, 2020, p. 4).

Figure 23. The ‘Whole-of-Person’ Retention Improvement Framework. (Cosgrave, 2020, p. 3).

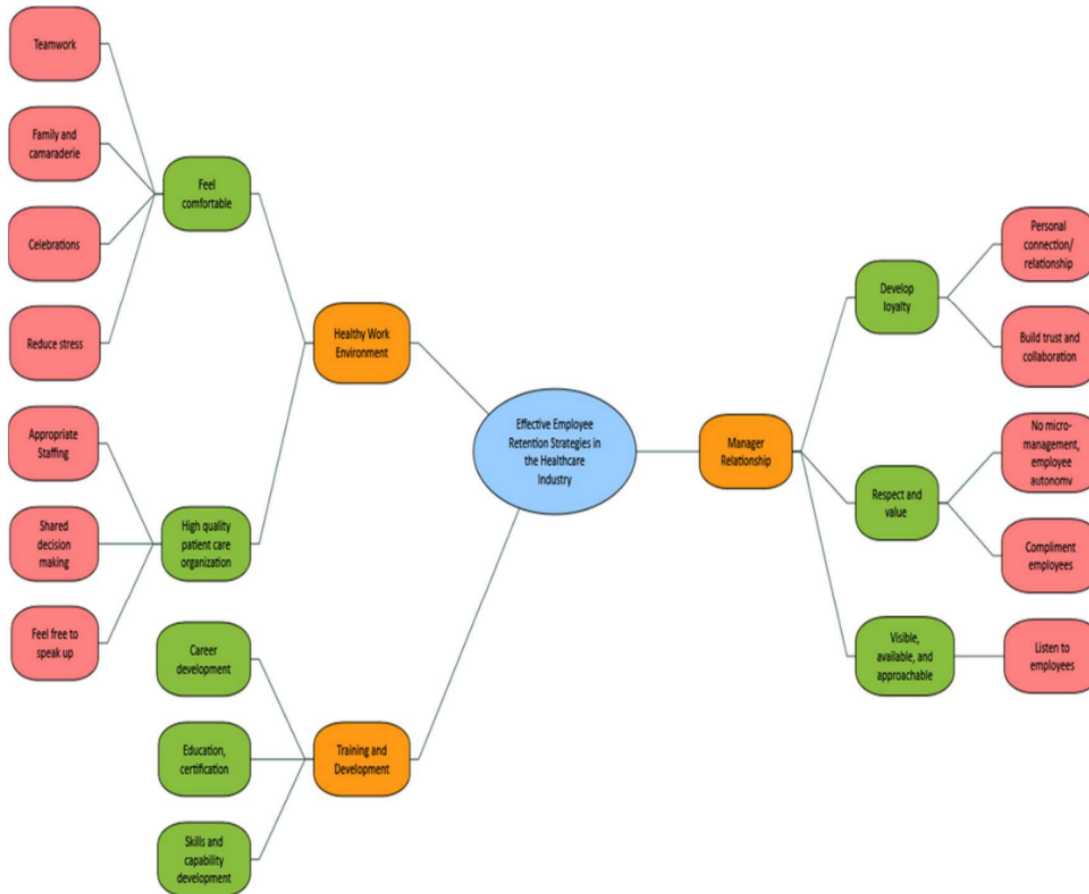


The author refers to the overlapping nature of different domains but does not discuss the interconnections and relationships of different components. This model is referred to specifically for rural healthcare, which identifies the context, but other external factors influencing retention are not mentioned.

Employee retention strategies in the healthcare industry

Doctoral work by Knight (2018) on strategies to retain employees in health care identified three main domains, namely healthy work environment, training and development, and manager relationship. Figure 24 outlines different factors leading to each of these domains, which are impacting employee retention. It is important to note that figure 23 is also a linear view of retention. Interrelationships among the individual components are not noted. Furthermore, the impact (negative or positive) of individual components on each domain is not noted.

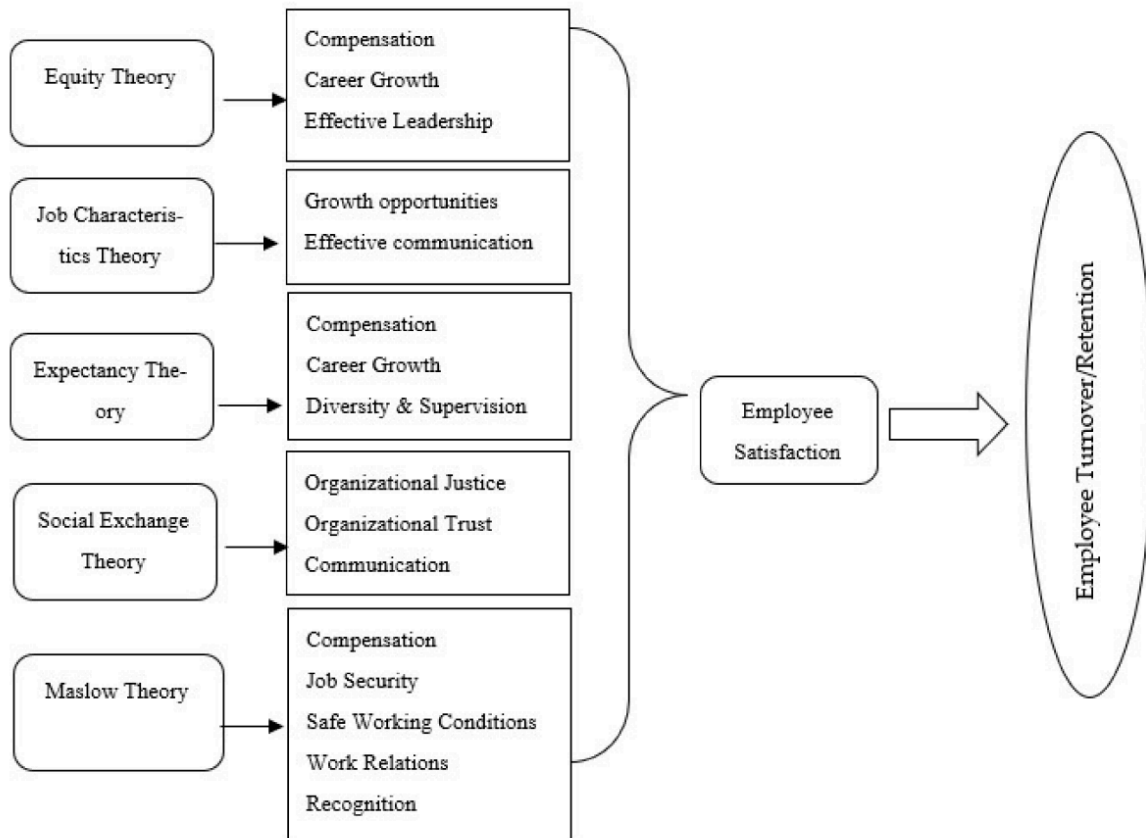
Figure 24. A mindmap of effective employee retention strategies in the health care industry. (Knight, 2018, p. 63).



Overview of employee retention theories

Another study by Ghani et. al. (2022) compared several employee motivation and retention theories to reduce the turnover rate in the hospitality industry. They pointed out some key components in a linear structure. Retention rate is dependent on “employees' level of satisfaction, which is composed of four factors: sustainable and positive work environment, sustainable growth opportunities, sustainable and effective communication, and sustainable and effective recruitment and selection.” (Ghani, et. al., 2022, p. 7). The components identified from each theory are listed as an opportunity for the organization to act on but do not refer to the interrelatedness of these components (Figure 25).

Figure 25. Model of theories which are relevant to employee retention. (Ghani et. al., 2022, p. 8)



Minimal research is available discussing the retention of respiratory therapists. An abstract published in the respiratory care journal attempted to identify factors related to retention and employee engagement. This was a survey that identified “building teamwork and improving communication between staff and among leadership” as a key element in employee retention and engagement. (Gardenhire, David, Culbreth, & Scates, 2018). This study was conducted prior to COVID-19. Systems thinking tools were not utilized in this study.

A master’s thesis studied respiratory therapists in Ohio. Managers and staff were surveyed to examine effective retention strategies. 17 retention strategies were divided into compensation/perks, working conditions/environment, and recognition/respect. The study said, “managers and clinicians have the same perceptions about the level of effectiveness for most of

the 17 strategies” and clinicians rated compensation/perks as the highest-rated section. (Hunter, 2009, p.36). The study does not refer to systems thinking or systems thinking concepts.

In discussing teacher vacancies, the traditional approach by human resources in filling a position (open vacancy, candidate interviews, new teacher hired, vacancy filled) was considered inadequate. This approach is treating only the symptom. The authors suggested exploring teacher retention from a systems perspective “seeing interconnected parts such as the complexity of teachers' lives and the current political environment in education.” (Minarik, Thornton, & Perreault, 2003).

In a nutshell, the majority of employee retention research is analytical and reductionist. While the components or parts of the system are identified, several studies do not mention the containing environment. When parts are identified, the interrelationships between them are rarely mentioned. Feedback loops are missing in most of the reviewed models, as well as in the application of these models in the reviewed literature. At this point, a review of literature on systems thinking will follow.

Systems Thinking Literature

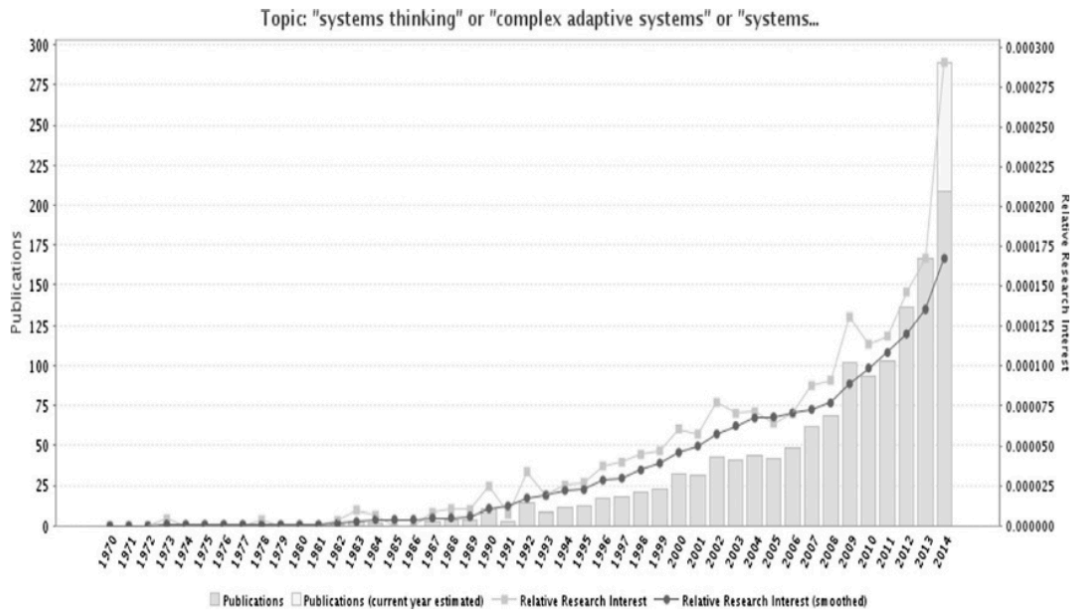
The basic methodology to understand how things worked was by taking them apart. In a three-step process which includes taking apart, trying to learn the behavior of the parts separately, and then putting them back together to get the whole, became the basic was of scientific inquiry, called analysis. This viewpoint is reductionism. (Ackoff, 1999). But, the whole often is not recognizable from the parts. “The whole emerges from the interactions between the parts, which affect each other through complex networks of relationships.” (Jackson, 2003).

Different fields of science identified single elements like the cell the biology and the atom in chemistry. These specializations worked within themselves in isolation. In response to

the isolation of disciplines and their theories, Boulding (1956) introduces the idea of general systems theory (GST) where he states that interactions of the parts of the system with the environment is an important concept. In his argument, his concern is not with a “general theory of practically everything” which will sacrifice content for generality. This type of isolated view is reductionist. GST attempts to bring forth similarities from different disciplines to develop models that will have applicability in at least two disciplines, thereby attempting to remove some of the reductionist boundaries. (Boulding, 1956).

The limited view of reductionist thinking led to an alternative known as holism, which considers systems to be more than the sum of their parts, where the focus is on understanding how the parts influence the whole or the system. (Jackson, 1999). Ackoff (1999b) summarized a definition of “system” from literature, “A system is a whole that cannot be divided into independent parts without loss of its essential properties or functions.” (p. 8). Checkland (1986) identified wholeness as a key concept in systems thinking, and this as a primary concept to order thoughts. These systems must consist of parts, interconnectedness, and purpose. (Meadows, 2008). This change in mindset is receiving increased attention in healthcare operations and management. Adam (2014) noted an increase in interest in topics such as systems thinking, complex adaptive systems, and systems science in healthcare publications (Figure 26). The increase in the use of these topics in publications shows the relevance of approaching healthcare problems from a systems thinking lens. But there are limited publications on healthcare employee retention and systems thinking, but it gives hope.

Figure 26. Trends in the use of the terms “systems thinking”, “complex adaptive systems”, or “systems science” in the Medline database over the past 40 years. (Adam, 2014, p. 2)



Principles of a system

The five principles of a system are openness, purposefulness, multidimensionality, emergent property, and counterintuitive behavior, and these principles are interconnected. (Gharajedaghi, 2011).

Openness: Peters and Waterman (2004) discussed this as a change from “mechanical thinking in organizations (closed) to gestalt thinking (open).” (p. 91). In mechanical thinking, the focus was primarily on improving internal systems; the external environment and its relationship to the organization were not a concern. The open system concepts came later when theorists started to note the impact of external factors on the internal system. (Peter & Waterman, 2004). Open systems can be understood only in the context of the environment it is in. (Gharajedaghi, 2011).

Purposefulness: A purposeful system can produce “the same functional type of outcome in different structural ways in the same structural environment” and “can produce functionally different outcomes in the same and different structural environments.” (Ackoff & Emery, 2017,

p. 31). Drawing from Ackoff’s distinction of system behavior, namely reactive, responsive, and active, Gharajedaghi (2011) developed the following behavioral classification of systems.

Table 6. Behavioral Classification of Systems (Gharajedaghi, 2011).

Behavior Process	Means Structure	End Function
Passive Tools	No Choice, One structure in all environments	No choice, One function in all environments
Reactive State Maintaining	No Choice Variable but Determined	No Choice, One function in all different environments
Responsive Goal seeking	Choice of means Variable and Chosen	No choice of ends Variable but determined
Active Purposeful	Choice of means Variable and Chosen	Choice of ends Variable and Chosen

A reactive system responds to the environment but does not learn or adapt. A responsive system responds differently to the same or different environments until a particular outcome is produced. An active or purposeful system is able to constantly learn, adapt and create in same and different environments, and can change its ends. (Gharajedaghi, 2011).

Multidimensionality: Multidimensionality refers to the various dimensions of the system. Instead of looking at things as a pair of opposites, Gharajedangi (2011), refers to them as interacting components (even with opposing tendencies) that together represents the whole. He proposes a view of ‘continuums’ instead of ‘dichotomy,’ where the former refers to a middle ground in between the opposites, whereas the latter is a ‘win or lose’ situation where only one side wins. Conflict resolution is often between the two opposites where middle ground can be found. Furthermore, these opposing tendencies “not only coexist and interact, but also form a complimentary relationship.” (Gharajedaghi, 2011, p. 39). Forrester’s (1971) view on moving to equilibrium from growth, which is an aspect of stabilization or finding balance in the system is also important to note.

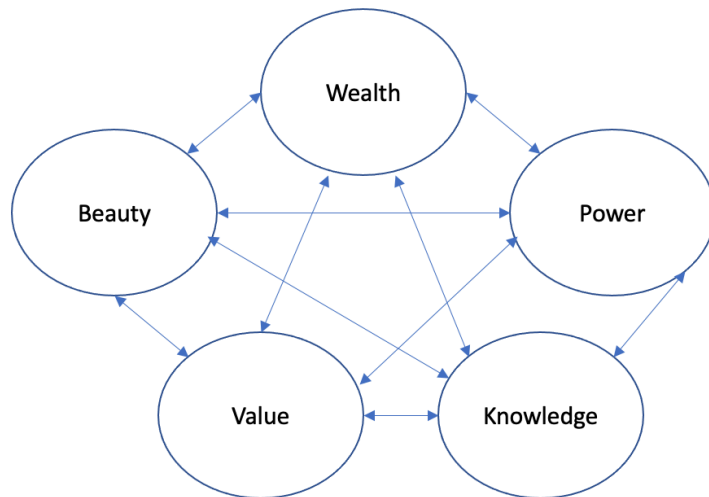
Emergent property: The product of the interaction of the parts is emergent. It cannot be produced by the parts alone or by any part that is taken apart. Furthermore, Gharajednaghi (2011) said, emergent properties cannot be analyzed or manipulated by analytical tools. Favorable or unfavorable outcomes of the system cannot be changed or reproduced in isolation by looking at the parts separately. The focus is not on individual parts, but on the interaction of these parts. “If the processes that generative them (*emergent properties*) end, the phenomena will also cease to exist.” (Gharajedanghi, 2011, p. 48).

Counterintuitive behavior: Counterintuitive behavior refers to the possibility of opposite results as opposed to desired outcomes of actions. (Gharajedanghi, 2011). “The known and intended practices of the organization are fully sufficient to create the difficulty, regardless of what happens outside the company or in the marketplace.” (Forrester, 1971, p. 63). Even though these known and intended practices are to develop desired outcomes for the organization, it is not predictable. Furthermore, there could be short-term and long-term impacts of the actions, some that are perceived to be ideal could prove to be wrong at a later time. Using smoking as an example, Gharajedanghi 2011, refers to short-term satisfaction of smoking vs. long-term impact to explore this property. Similarly, increasing compensation as the primary response to retain staff will have short-term and long-term impacts, and neither is clear at the moment.

Gharajedaghi (2011) explores further five dimensions of social systems, namely, wealth, power, knowledge, value, and beauty (Figure 27). Gharajedaghi (2011) holds a criticism that many prominent social thinkers considered only one of the several dimensions of social systems in developing their viewpoint, quoting Marxian theories focusing on wealth (economy), and Weber’s theories focusing on power. These five dimensions are interconnected holding “and” relationship (Gharajedaghi, 2011, p. 96) where these dimensions are complementary to each

other and cannot be studied in isolation. Interaction of these parts coproduce properties of the system.

Figure 27. Five dimensions of a social system. (Gharajedaghi, 2011, p. 95)



Ideal Practice vs. Ideal Process

Ideal (or best) practice is a commonly used term in healthcare, especially in clinical management. These practices are evidence-based and tested and published in the medical community. Such ideas are also present in healthcare management. In best practice, the practice that was identified to be efficient and effective (in one organization or several organizations) is generalized into a practice that can be adopted everywhere. The use of the Toyota production system (TPS) in healthcare is such an example. Ideal practices are developed and proven to be successful in the organization (or organizations), which then is adopted by other organizations, with the assumption that what worked in that organization will work everywhere else too. Gaudet (2020) said, best practices are “developed by people solving for a particular problem. They have done the hard work of trying to understand all the finer details of a specific problem.”

(para. 23). These are designed for a particular context which is different between systems.

Gaudet (2020) refers to adoption of best thinking in organizations as opposed to best practice.

Diffusion of innovation

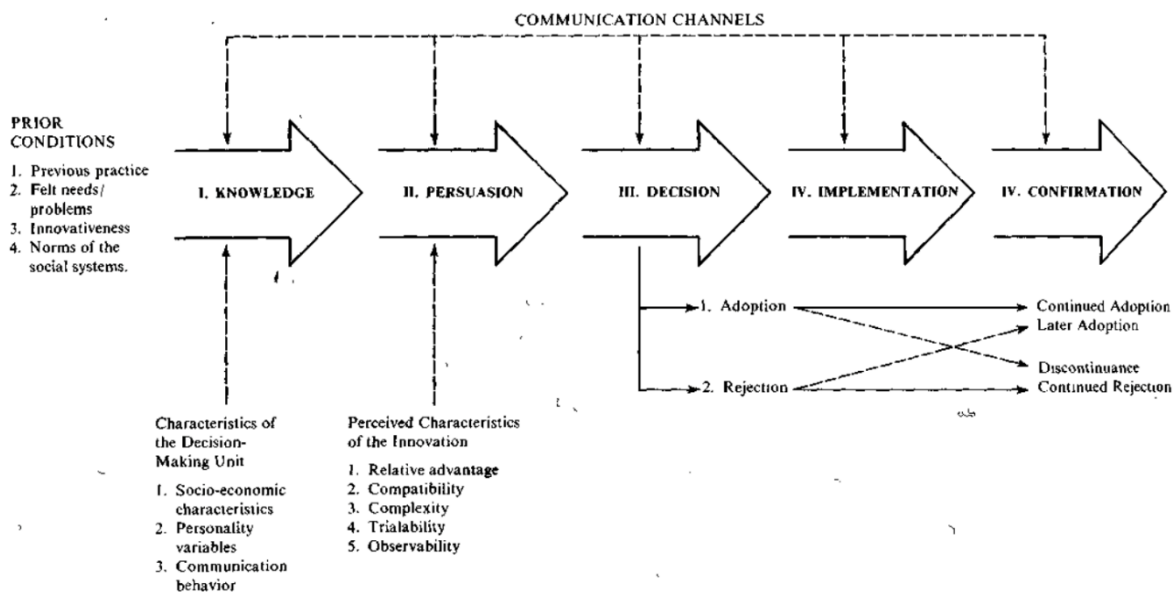
Adoption of ideas, referred to as diffusion, is defined as “the process by which an innovation is communicated through certain channels over time among the members of a social system.” (Rogers, 1983, p. 5). It is a “kind of social change, defined as the process by which alteration occurs in the structure and function of a social system.” (Rogers, 1983, p. 6). Rogers (1983) said, the four main elements of the process of diffusion are “(1) an *innovation* (2) is *communicated* through certain *channels* (3) *over time* (4) among the members of a *social system*.” (p. 10). Innovation is a new or different way of approaching a problem, where the perception of the idea being new will support the adoption of an idea. (Rogers, 1983). The idea (new or existing) is communicated in the organization. Most importantly, this is understood and accepted based on subjective interpretation of the idea rather than scientific evaluation. (Rogers, 1983). The organization’s mental model and learning culture are important in adopting innovative ideas. Idea transmission is not a linear process but a system process, where the transmission of information travels through formal and informal networks (channels).

Cynefin framework and response to problems

Implementation of a best (or ideal) practice is not ideal in complex systems. Complex systems need solutions that are process-informed and emergent. According to Snowden’s Cynefin framework (figures 11 & 12), retention of respiratory therapy staff is a complex adaptive systems problem that requires not an adoption of a best practice. Complicated domain, which is reasonably ordered and structured, uses good (or best or ideal) practice. Expertise and best practices are insufficient in this domain. In a complex domain, like staff retention, which is

unordered and unstructured, practice is emergent. Ideal process emerge from the interactions of the parts in the system. (Snowden, et. al., 2021). As an example, Darling-Hammond, et. al. (2019) propose compensation, working conditions, and professional learning as three major components to maintain teacher retention. But the interaction of these parts, containing system, etc. are not addressed. This is an example of best practice. Best (ideal) process will utilize all elements of the process of diffusion. What may work well in one hospital ER may not work at all in another different hospital ER because the organizational systems are different. This argues less for best practices implementation and more for best processes of design. Such an example known as the innovation-decision process is described in Figure 28.

Figure 28. A model of stages in the innovation-design process (Rogers, 1983, p. 165).



The innovation-decision process, which is applicable to an individual or a decision-making unit, has five components: knowledge, referring to an awareness of the existence of innovation; persuasion, referring to a favorable or unfavorable attitude towards the innovation; the decision to adopt or reject the decision is made; implementation, when the innovation is implemented; and confirmation, which is a reinforcement of the innovation or changes to the

previous decision happens in this stage. (Rogers, 1983). In each of these stages, the process of diffusion is intertwined in the system, where the properties of the system become an important factor in the diffusion of innovation. Reflecting on organizational learning, which is an important factor in the adoption of new ideas (diffusion) in a system, Kim (1993) discussed a systems-informed loop of individual learning where individual and organization learning are considered complex. Individual learning and organizational learning are key components of the diffusion of ideas (Rogers, 1983). The level of complexity increases tremendously when going from individual learning to organizational learning (Kim, 1993), hence requiring system-informed approaches in problem-solving.

Design Thinking

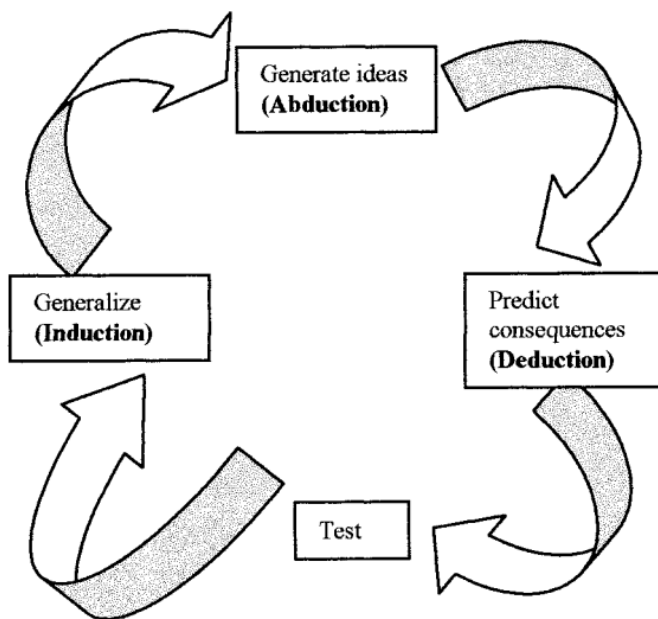
According to IDEO, a global consulting company, “Design thinking is a process for creative problem-solving.” (Ideo U, n.d., para. 1). Developed by David Kelley, founder of IDEO, design thinking has two core values, which are “human centered” and “creative mindset.” Human centered refers to the centering purpose as not a business proposition, but the “needs and desires of people.” It involves “observation, conversation, research, and collaboration.” (Ku & Lupton, 2020, p. 10). Creative mindset refers to “an open-ended exploration over a straight path headed toward a given outcome” involving “asking questions, visualizing ideas, creating tangible prototypes, and telling stories about people, ideas, and outcomes.” (Ku & Lupton, 2020, p. 10). A set of design principles are: transparent, inspiring, transformational, participatory, contextual, and sustainable. (IDEO Design Thinking, 2009).

A few design thinking models

Roger Martin, another pioneer in design thinking, considers design thinking as a solution for “wicked” problems. (Dunne & Martin, 2006). Wicked problems, according to Horst Rittel

and Melvin M. Webber, or messes, according to Russell Ackoff, are “difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognise. And problems that cannot be fixed, or for which there is no single solution.” (Barnett, 2020, para. 3). Cognitive, affective, and interpersonal are three aspects of design thinking. Cognitive aspect includes inductive, deductive, and abductive reasoning, proposed as a cyclical process found in figure 29. (Dunne & Martin, 2006).

Figure 29. The cycle of design thinking (Dunne & Martin, 2006, p. 518).



Affective or attitudinal aspects refer to the mindset of the designer to see constraints as opportunities. Interpersonal aspects refer to the designer “understanding the users’ perspectives and needs” and “collaborating with peers.” (Dunne & Martin, 2006, p. 519).

Design thinking projects go through three stages, according to Brown (2008), which are inspiration, ideation, and implementation. Ku and Lupton (2020) also proposed a similar structure named observe, imagine and make. Acceptance of competing constraints is the foundation of design thinking. They are feasibility, viability, and desirability. (Brown, 2009).

The idea should be feasible, which means it is “functionally possible within the foreseeable future,” viable, which means it is “likely to become part of a sustainable business model,” and desirable, which means it makes “sense to people and for people.” (Brown, 2009, p. 24).

A third version is Idealized Design by Russell Ackoff, which has its own set of principles. All three components of the design thinking foundation are identical to Ackoff’s two constraints and one requirement for the idealized design process, which are technological feasibility, operational viability, and learning and adaptation (Ackoff, 2001). Design thinking, according to Brown (2009) will be able to bring these constraints into “harmonious balance.” (p. 24). The steps involved in the design process are: “first, fully understand the problem; second, explore a wide range of possible solutions; third, iterate extensively through prototyping and testing; and finally, implement through the customary deployment mechanisms.” (Linke, 2017, para. 3). Design thinking is proposed to be a model for solving complex problems. Ackoff’s idealized design, described in chapter 3 is used for this dissertation.

Conclusion

The introduction and literature review argued that retention of respiratory therapists is a complex problem. Complex problems are unordered and unstructured, and have emergent and evolving properties. This type of problem requires a systems-informed mindset. In this view, the problem is not seen as a sum of parts but as an evolving and emergent property of the whole. Interactive planning and idealized design is a systems approach used in this dissertation to dissolve the problem.

CHAPTER 3

METHODOLOGY

Research Questions

This dissertation proposed two research questions:

1. When the challenge of respiratory therapy staff retention is formulated as a complex systems problem, what differences in understanding emerge compared to the prevailing analytic approach to problem formulation?

This question is answered in Chapters 1 and 2, where retention of respiratory therapists is formulated as a systems problem in a complex context. Traditional staff retention approaches and strategies isolate problems with reductive and analytical thinking, but a complex problem requires systems methodologies, tools and processes. Systems thinking provide approaches and processes (instead of relying on practices) to navigate these types of problems.

2. When the challenge of respiratory therapy staff retention is addressed using systems-thinking and design-thinking problem dissolving methodologies and tools, what outcomes and implications emerge compared to applying analytic and research methodologies and tools, the prevailing approach of problem solving?

The response to this question is framed in Chapters 3, 4 and 5. According to Forrester (1971), “proper use of models of social systems can lead to far better systems” (p. 62). In this chapter, interactive planning and idealized design systems methodologies are explained and a description of how they were applied is presented. Results of these applications is in Chapter 4, and discussion on the meanings and outcomes of utilizing these systems-informed approaches to develop an ideal retention system for respiratory is presented in Chapter 5.

Institutional Review Board (IRB)

The proposal for this dissertation was submitted to Thomas Jefferson University IRB. Upon guidance from the IRB, the submission was made directly to the associate director of human research at Thomas Jefferson University. The OHR-34 form (Appendix H) and study proposal were completed and submitted to the associate director of human research. OHR-34 form is the checklist for research not requiring IRB review. On October 21, 2022, it was deemed that this project does not constitute human research as defined by federal regulation and does not require IRB review. The OHR-34 form was filed.

Interactive Planning and Idealized Design

Interactive design process

When conceiving how to intervene and make changes to a problematic situation, four types of management thinking and practice exist according to Ackoff (1999b). He labeled these reactive management, inactive management, preactive management, and interactive (Figure 30a, 30b, 30c and 30d). Those adopting *reactive* management and planning believe current reality (where we are) has many problems which were not present in the past at which time there was a preferred and better state. The goal of reactive planning (where we want to be), therefore, is to create changes based on a past state.

Figure 30. Four approaches to planning (Ackoff 1999b)

Figure 30a. Reactive Planning



Figure 30b. Inactive Planning

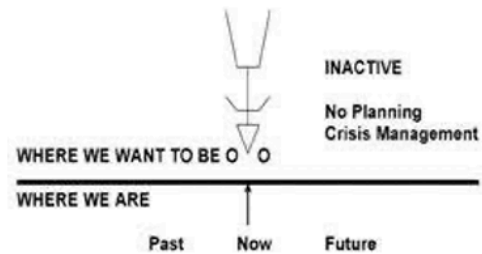
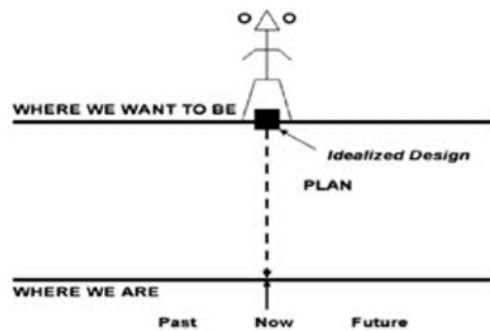


Figure 30c. Preactive Planning



Figure 30d. Interactive Planning



Inactive management and planning presume the existing state is acceptable and desirable so actions are designed to avoid substantial changes and to support the status quo. As these focus almost entirely on the current situation, there is often little preparation for future emergencies or changes in context.

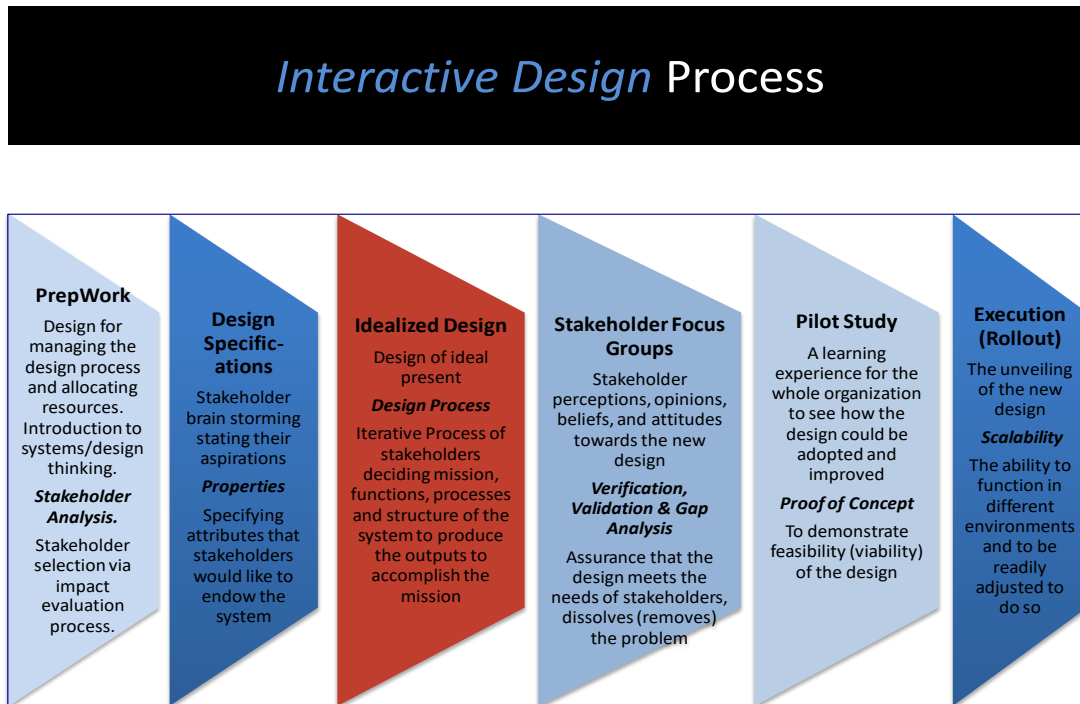
Those who adopt *preactive* management and planning believe the current situation is less desirable than a future and “better” state so they attempt to predict the future based on available information from the past and present. This is the approach of traditional strategic and project planning. Considerable criticism of this approach when the context is complex or turbulent has been reported in the literature. Martin (2014) criticized strategic planning in organizations, which

is typically filled with developing strategies and plans aiming for the future. Forecasting the evolution of markets in an unstable and volatile market is not the ideal solution. (Mankins & Gottfredson, 2022).

Interactive management and planning holds the premise that the past is over, the future cannot be predicted, and that current reality may be improved and changed by redesigning it now via interactive strategic planning and idealized design. As noted by Pourdehnad, Wexler and Wilson (2011, p. 7), “Interactive planners believe the future is subject to creation. They believe the best means of revealing a desirable future is by enabling the stakeholders to do it themselves.” In this systems-informed approach, people are empowered to create the world they are to live in through this process. (Ackoff, 1999b). Interactive planning is a preferred methodology for navigating complex contexts and problems (Starr, 2022a; 2022b).

As this dissertation argues that staff retention is a complex systems problem, the preferred methodology to address this is to adopt interactive management and planning. I therefore applied the first three parts of the interactive design process; namely, preparation work, design specifications, and idealized design (Figure 31). The last three parts, stakeholder focus groups, pilot study, and execution are not part of this dissertation.

Figure 31. Interactive Design Process



Interactive planning is a systems-thinking methodology to solve and dissolve messes or wicked problems. One of the premises of interactive planning is the importance of changing the mindset of decision makers from analytic to systems thinking. This can be enabled by creating a disruption of the prevailing analytic mode of thinking which promotes proactive, inactive and reactive improvements. Interactive planning, therefore, starts by presenting the assumption that there is nothing to improve or change because nothing now exists. It is up to the designers/participants to creatively approach the problem and to design what they want as long it is viable, feasible and desirable. Idealization consists of formulating the mess (describing the current reality of the situation) and end planning (describe what is desired if anything could exist); and realization consists of resource planning and design of implementation and control (Ackoff, 2001).

Principles of interactive planning and idealized design

Three principles guide interactive planning. First is the participative principle, where all stakeholders are expected to participate (Jackson, 2003). Stakeholders in this process include everyone necessary to make the new design happen and everyone who could stop it from happening. Participants engaging in this process “come to understand their organization and its environment, and how their behavior can improve performance of the whole, not just their part of it” (Ackoff, 1999a, p. 110). Second is the continuity principle, where continuous revision or adaptation of plans is expected due to the expected or unexpected changes (Jackson, 2003). This includes implementing planning decisions experimentally to allow for learning and adaptation (Ackoff, 1999a). Third is the holistic principle highlighting the importance of the interactions between the parts (Jackson, 2003), which has two parts, namely the principle of coordination and the principle of integration. (Ackoff, 1999a). These assert the need to plan simultaneously and interdependently. (Ackoff, 1999a).

In interactive planning methodology, the organization is subject to two constraints and one requirement in designing the new state. The design must have technological feasibility which means any technology that is not currently feasible is excluded to avoid the possibility of planning becoming a science fiction. The design must have operational viability which means the design should be capable of surviving in the current environment; and the design must support learning and adaptation which means the organization should be able to continually adapt to changes in internal and external environments with necessary systems that are built-in for learning and adaptation (Ackoff, 2001).

In a democratic organizational system, the parts have the choice to respond. Employees have the option to speak up, challenge decisions, and stop the organizations with a workers’

strike. Some organizations empower the employees to speak up; some organizations have employee unions that will speak for the employees. But, even in democratic and Western societies, free speech and criticizing the authorities may not go well and may create unnecessary tension (Ackoff, 1999). Haftor (2011) quoted Jackson's (2000) critique of interactive planning as "not capable of guiding identification and challenging social power-structures that may be inherent in a managerial situation" and "not all stakeholders will always be allowed to participate in the execution." Interactive planning, therefore, requires sponsorship from the "top" and courage from all; it is not for the "faint-hearted."

Steps of interactive planning and idealized design

The purpose of interactive planning is to design a future state that is desired right now. The idealized design process is intended to empower creativity and remove constraints from the participants, often self-imposed by the organizational culture (Ackoff, 1978).

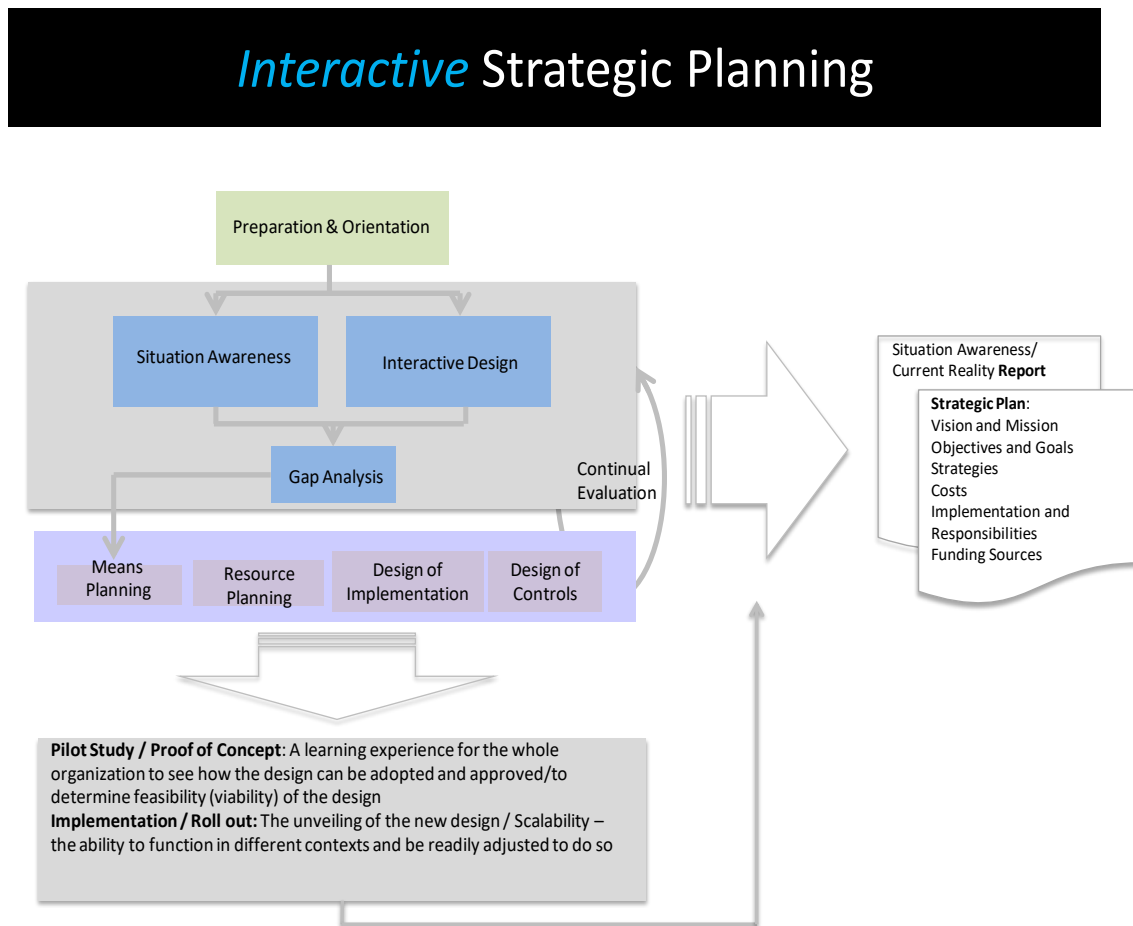
The steps of the strategic interactive planning process are depicted in Figure 32. The components and activities of interactive planning are as follows:

Preparation and Orientation refers to the information provided to the stakeholders participating in the idealized design session. The email will consist of details regarding the idealized design session, meeting schedule and agenda, and video conferencing information.

Situational Awareness refers to examining and describing the problem and its context, i.e., retention of RT staff in a major medical center. Ackoff (1999b) referred to this as the Mess Formulation and described it as the process to understand the current reality of the environmental context in which the organization functions and the current state of the organization. The broader Mess formulation includes a situational analysis, which "requires identifying sources, seeking them out, soliciting and collecting their knowledge and understanding, and compiling it into a

comprehensible form.” (Ackoff, 1999b, p. 63). The outcome of mess formulation is to have the members of the organization identify how the organization would destroy itself if it fails to adapt to the changing internal and external contextual environments (Ackoff, et.al, 2006). Mess formulation involves four steps. First is the preparation of a systems analysis, which is “a detailed description of how the organization currently operates.” (Ackoff, et. al., 2006, p. 6). Second is the preparation of an obstruction analysis, which is the identification of characteristics that will obstruct change. Third, preparation of reference projections, which is a projection of the organization if no changes are made. Fourth, combining the information from steps one, two, and three to prepare a scenario of the possible future of the organization. (Ackoff, et.al., 2006).

Figure 32. Interactive strategic planning process.



Ends Planning is the process of determining what the organization wants. “It involves what the planners would like the organization or institution to be now if it could be whatever they wanted” (Ackoff, 2006, p. 7). Identifying the gaps between the organization’s current state and the idealized design is an important step in this process, from where the planners can work on closing these gaps (Ackoff, 1999b). Consensus and commitment of people participating in the process of designing the organization will be significantly better and will reduce potential difficulties in implementation of the plans (Ackoff, 1999b).

Means Planning is the step to close or reduce gaps between the current state of the organization and the desired state of the organization, designed at ends planning state (Ackoff, 1999b). Ackoff (1999b) said, “the future can be significantly affected by what we do by controlling the causes of uncertainty, controlling their effects, increasing responsiveness to change, using incentives, and inducing cooperation and reducing conflict among stakeholders.” (p. 109). Types of means are acts, courses of action, practices, processes, projects, programs, and policies (Ackoff, 1999b).

Resource Planning concerns identification of resources needed, such as financial, human capital, and capital equipment; as well as resources to be eliminated, such as certain types of services and facility; and resources requiring change, such as restructuring of the organization, are three ways to manage resources (Ackoff, 1999b).

Design of Implementation consists of determining and allocating resources to carry out the strategic design plan (Ackoff, et. al., 2006).

Design of Controls consist of monitoring planning and implementation, making appropriate adjustments and corrections, and monitoring results (Ackoff, et. al., 2006). This includes meaningful interpretation of available data, allowing the system to generate appropriate

feedback for learning and adaptation (Ackoff, 1999b). This feedback loop allows the system to constantly adapt and change.

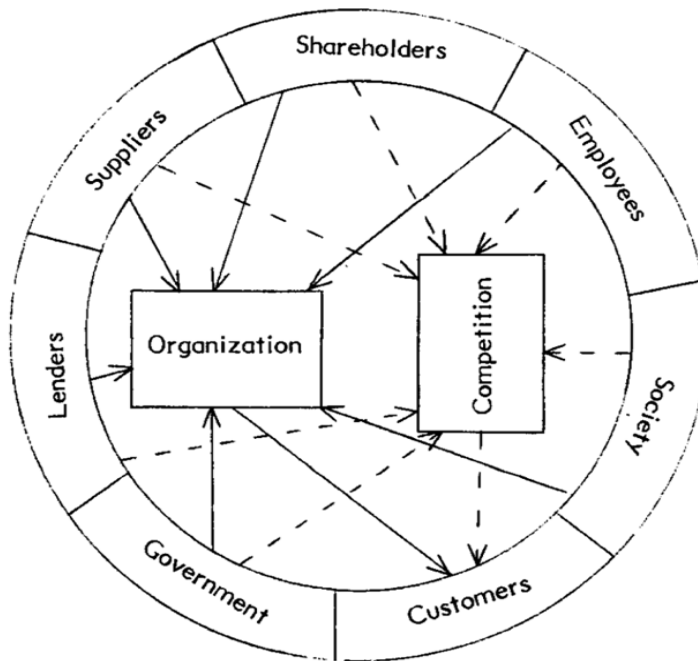
Stakeholders/Participants

To conduct interactive planning/idealized design, stakeholders must be present to play the role of designers of the system that will replace what currently exists. Stakeholders may be identified by a process referred to as stakeholder analysis. Stakeholder analysis, according to Varvasovszky and Brugha, (2000), is “an approach, a tool or set of tools for generating knowledge about actors – individuals and organizations – so as to understand their behavior, intentions, interrelations, and interests; and for assessing the influence they bring to bear on decision-making or implementation processes.” (p. 338). Reed et. al. (2009) noted that stakeholder analysis,

- i) defines aspects of a social and natural phenomenon affected by a decision or action; ii) identifies individuals, groups and organisations who are affected by or can affect those parts of the phenomenon (this may include non-human and non-living entities and future generations); and iii) prioritises these individuals and groups for involvement in the decision-making process (p. 1933).

Stakeholders are interested in the issue, are able to influence it positively or negatively, are part of the development and implementation, have formal and informal networks of relationships that could impact the project, and could be internal or external. (Varvasovszky & Brugha, 2000). A systems view showing the relationship between the organization and its stakeholders is depicted in Figure 33. The stakeholder categories listed are not exclusive. Importantly, Figure 33 depicts the interrelationships between the stakeholders.

Figure 33. Relationship between the organization and its stakeholders (Mendelow, 1981, p. 409).



Stakeholders identified for this dissertation are categorized in Table 7. Participation of all involved stakeholders in the idealized design process is an important aspect to build trust and commitment to the implementation of the design (Ackoff, 1999b). Stakeholders are categorized using the influence-interest matrix used by Reed et. al. (2009) in Figure 34. A total of 70 stakeholders were identified.

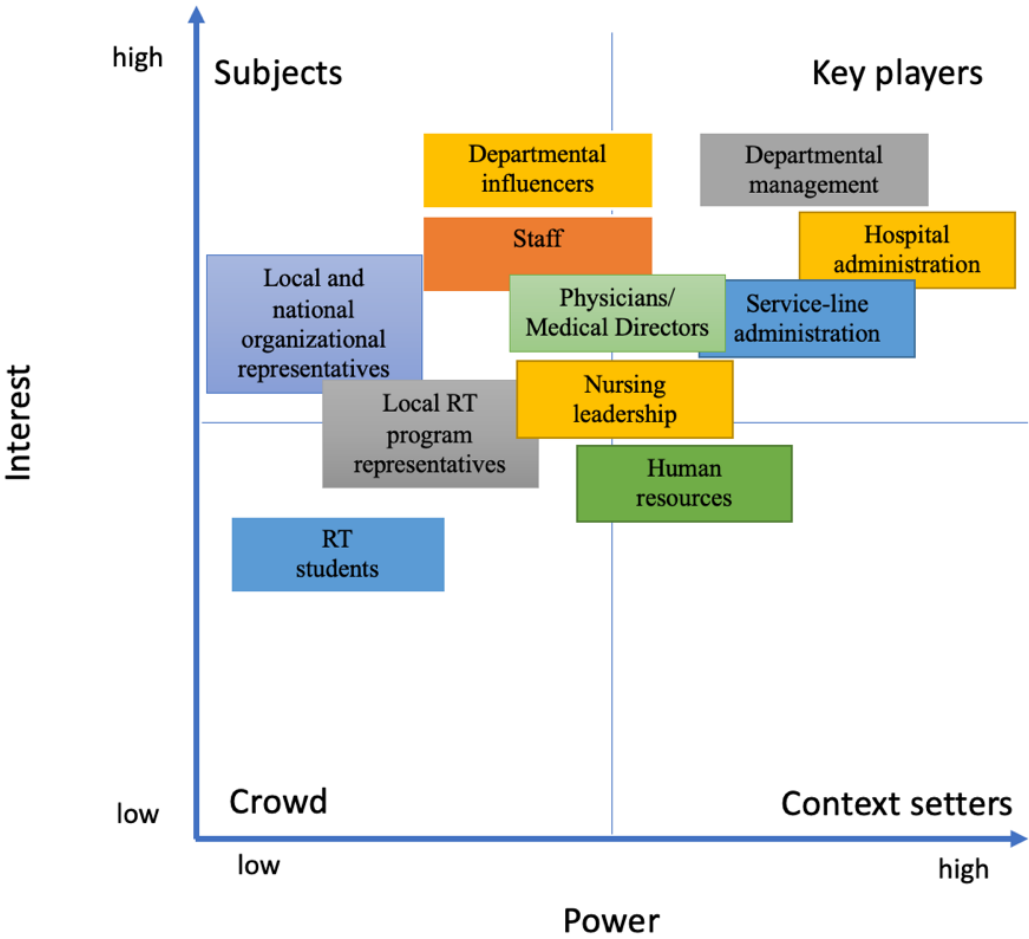
Table 7. List of stakeholders

Category	Stakeholder/s	Reason for inclusion	Total Invited
Hospital administration	Chief Nursing Officer, Chief Nurse Executive, VP, Patient Care Services	Financial management and resource allocation require hospital administration leaders to agree to the proposed design and resource requirements. Changes in practice require approvals from hospital administration. Design of the retention plan and its relationship with other	CNO (1) Chief Nurse Executive (1) VP (2)

		departments in the division in managed by administration.	
Human resources	Divisional HR Lead Enterprise Talent Acquisition Lead	Approval of job descriptions, job changes, compensation, and retention strategies requires HR participation and approvals.	Divisional (2) Enterprise (2)
Service-line administration	AVP, Respiratory Service-line Respiratory Divisional Leaders	Changes to the division impact the enterprise. Service-line lead connects the respiratory therapy departments across the Jefferson enterprise. Respiratory Therapy works closely across the enterprise in implementation of initiatives to retain and maintain staff	AVP (1) Directors (3) Managers (2)
Physician leadership	RT medical director, ICU directors and physicians	RT team works closely with physicians. Physicians are closely involved with RTs and are interested in retaining trained RTs.	Chief, Service-Line (1) RT medical director (1) ICU physicians (6)
Nursing	ICU Nurse managers and clinical practice leaders Magee nurse manager	RTs work closely with RN leadership and staff RNs. Hence, their perspective on retaining staff is important.	Nurse manager (3) Clinical practice leads (3)
Security	Security management	Security of staff members at the center city hospitals is an ongoing concern	VP, Public Safety (1)
Departmental management	Manager, Supervisors, Team leads	Departmental leadership is a key stakeholder in designing and implementing the retention plan.	Manager (1) Supervisors (4)
Departmental influencers	Lead and charge therapists	Charge therapists are influences able to carry the project to the rest of the staff. Charge therapists are keenly aware of the environment and internal challenges in the department.	Lead RT (2) Charge RT – Day shift (6) Charge RT – Night shift (6)
Staff	Selected staff members	Staff members are key members with deep knowledge about the functioning of the department, especially the	Staff Day Shift RT (6) Staff Night Shift RT (6)

		informal culture. They can be the torch holders in bringing the design to effective implementation.	
RT students	Students rotating through the organization	RT students provide a very important perspective on their view of the ideal organization.	RT Students (3)
Local and national organizational representatives	PSRC and AARC officials	Local and national leaders from respiratory organizations provide a unique overview of the external environment and the changes in the field.	PSRC (2) AARC (2)
Local RT program representatives	Programs directors and clinical directors from local programs	RT program representatives provide key perspectives on upcoming talent.	RT program representatives (3)

Figure 34. Influence-interest matrix (Adapted from Reed et. al., 2009, p. 1942).



The idealized design process should involve all involved stakeholders to develop commitment and participation in the process and implementation. It is important for the stakeholders to feel ownership of the process (Ackoff, et.al, 2006). Idealized design also is limited to the willingness and comfort of the stakeholders. The process cannot make changes to the existing hierarchies. The presence of hierarchy may cause participants to be less participative or not fully open to the process. Ultimately, the participation of the stakeholders, one of the key principles of interactive planning, is limited to participant willingness and comfort (Eriksson, 2007).

Changes in the system could cause potential conflicts. Ackoff (1978) suggests the design process as a solution to dissolve the conflict, as opposed to a solution or resolution. Solving a problem is defined as one side of the situation winning by reducing the choice of the opponent. Usually, the side with power will win, where the relationship is one or the other (Gharajedaghi, 2011). Resolution is a compromise between the involved parties (Ackoff, 1978). The ideal solution is to dissolve the conflict. According to Ackoff (1978) “the conditions that produce it are changed so that it disappears. This can be done by changing the environment or the opponents.” (p. 40). The multidimensional nature of the system calls for the opposing parts to be complimentary, causing the emergence of “a feasible whole from infeasible parts” (Gharajedaghi, 2011, p. 106).

Participants

An invitation to participate in the idealized design session was sent to all stakeholders by email. The invitation (Appendix A) consisted of a general introduction to the problem, the process approach, and the invitation to participate in the design process. Stakeholders who agreed were asked to complete a consent form (Appendix B) for participating in the design

session. Request to consent used Qualtrics, a survey platform a service that is password protected and secure. Each invitee was asked to attend one design session, with an expected approximate four hours of total time. Invitees were made aware that participation in this session is voluntary, they would not be compensated financially, and they could withdraw from the study at any time. Invitees who consented to the study were sent a reminder email approximately two weeks prior to the design session (Appendix C) which included an optional pre-session video on interactive planning for participants to watch.

When participants arrived and the session began, they were welcomed and introduced to the project and the process which included the agenda for the session (Appendix D), a summary of the research problem, participant guidelines (Appendix E), and a list of mission statements (Appendix F). The participants were provided with guidelines on collaborative skills during the session which included the following: a) Social Skills: taking turns, equal participation, calm voice, politeness, appreciation statements, waiting your turn, encouraging others; b) Communication Skills: attentive listening, paraphrasing, seeking clarification, accepting and extending the ideas of others, probing; c) Critical Thinking Skills: Suspending judgment, examining both sides of an issue, considering all factors, disagreeing in an agreeable manner. Participants were also asked to follow the following guidelines during the interactive design session (Table 8).

Table 8. Interactive design session guidelines for participants

Current system was destroyed last night
Larger containing system (Jefferson) remains intact
Focus on what <u>you</u> want - <u>your</u> ideal
Do not focus on what others should have or what is not wanted

If you disagree with a statement, offer an alternative

Do not worry about the likelihood of implementation

Do not worry about resource requirements

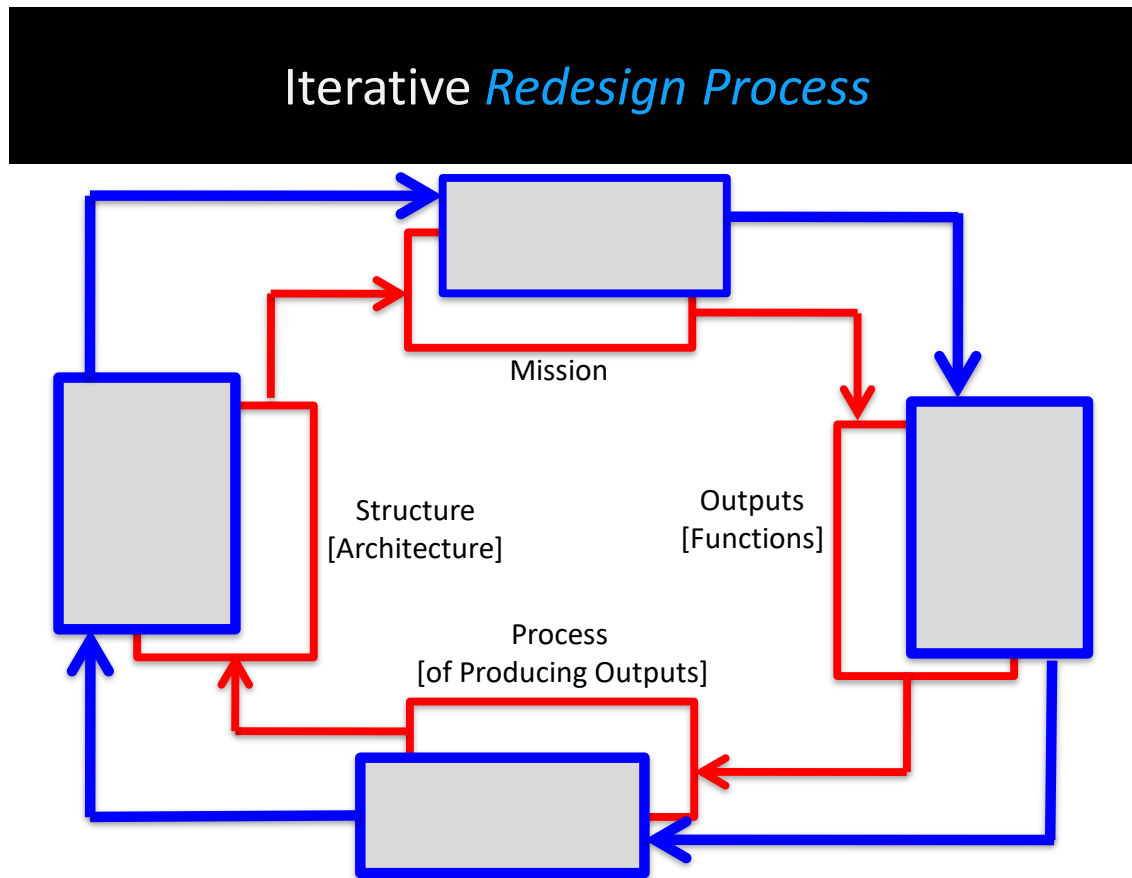
Facilitators

A systems mindset is required for effective interactive planning facilitation (Tull, 2020). Tull (2020) identified “curiosity, asking the right questions, openness, strong interpersonal and communication skills, navigating complexity, analytical ability, and tolerance for ambiguity as the traits that foster the systems thinking approach” (p. 100-101). To support these criteria, system-informed and trained practitioners with previous experience in interactive planning and idealized design supported the dissertation by facilitating the design session.

Materials and idealized design collection process

To collect the properties for an ideal respiratory therapy retention system, facilitators were provided with an introductory exercise followed by five question prompts to guide the collection process (Appendix G). After the introduction (an “icebreaker activity” and very brief introduction without any personal information), the participants were guided through the five topics. Topics for an ideal system are based on the interactive planning and idealized redesign process presented in Figure 35.

Figure 35. Interactive redesign process (Myles, et. al.)



As presented, the process involves a circular generation of properties beginning with mission then followed by outputs (functions), process (of producing Outputs), and structure (Architecture). By collecting properties in this manner the whole system to be redesigned can demonstrate integration.

Each question provided to stakeholders represented one of the characteristics of the design. Facilitators spent approximately 20 minutes per question. As each was presented, participants were prompted by the facilitators to generate properties and characteristics in a sentence or phrase. For example, Question 1 concerned mission: What is the reason for being? What is the mission of an *ideal Respiratory Therapist Retention System (RTRS)*? What is the

“value proposition?” As a participant called out a response, a facilitator recorded it on a flip chart that faced the group so all could read it. The purpose of this was to enable participants to see how the ideas generated were built on and related to each other. Participants were provided with a list of sample mission statements to generate thoughts (Appendix F).

After compiling a list of ideas, both groups worked on developing the ideas into a mission statement. The ideas generated for value proposition were also generated into a value proposition statement. Questions 2, 3, 4, and 5 concerned functions or outputs, process for producing outputs, and the structure for the Ideal Respiratory Therapist Retention System. The questions were a) what does an ideal RTRS provide? b) What are the primary functions (outputs) of an ideal RTRS?/What functions must the organization perform in order to produce the outputs or achieve the mission? c) Who are the customers (consumers)? d) How should the ideal RTRS organization differentiate itself from its competitors?

The facilitators followed the same structure of questions in both groups. Group 1 was facilitated by two facilitators. These facilitators coordinated the conversations. One of the facilitator primarily managed the conversations, whereas the other facilitator facilitated and took notes. In Group 2, the facilitator facilitated and scribed. Both groups followed the same order of topics. The properties that emerged from the conversation in both groups were titled based on the themes in the questions. When a flipchart page was filled, the facilitators moved it to the wall for further reference as needed. These sheets were organized in the order of the questions as they were posted on the wall. Each of these pages was titled with the key themes, which are mission, value proposition, functions or outputs, process, and structure. The first part of the interactive design session focused on the collection of data.

After completing session one, participants were given a lunch break. During the lunch break, participants were provided with directions for the second session. Participants were provided 30 minutes after the 20 minute lunch break to complete the following activity. All participants were asked to go to the ideas generated and listed on flipcharts by both groups. Participants were asked to read and select their top five emergent properties listed on the flip charts in both groups. Participants used markers provided to mark their top five in each section. After completing the second session, the participants were thanked for their attendance in this session and dispersed.

CHAPTER 4

RESULTS

The interactive planning design session was held at Thomas Jefferson University on January 13, 2023 from 9:00 a.m. to 1:00 p.m. Fourteen participants, three facilitators, project investigator, and the doctoral student attended the session.

The research problem and methodology of responding to them mandated the participation of system-informed facilitators. A total of 3 facilitators were available. While the end-goal of collecting design elements and properties was the same, the characteristics of and details of the process of how the facilitators carried out the collection varied. One facilitator focused on the structured interactive process (see Figure 34 from last chapter) of each question prompt in an orderly and sequential manner. One facilitator was a scholar and provided educational reasoning as part of the collection. The third was a communications coach and practitioner so was well-trained in interactive design facilitation. All facilitators generated positive engagement from their group as evidenced by the high level of conversation and number of elements and properties collected.

The 14 participants were divided into two groups of 7 participants. One facilitator was assigned to one group, and two facilitators were assigned to the other group. The assignment of facilitators was based on facilitator experience. One of the facilitators is experienced in facilitation skills and interactive design methodology. This facilitator has studied this topic extensively and also facilitated several interactive design sessions. This facilitator was assigned by herself to one of the groups. The other group was facilitated by two. One of them is an experienced communication coach, who is also experienced in facilitating interactive design sessions.. The second facilitator is a systems informed practitioner with experience in interactive

design sessions. The facilitators were assigned based on their prior academic and professional experience.

Data collection and analysis

The data generated and collected did not contain any personal information. As defined by interactive planning methodology, the facilitators focused on the process of data-collection, i.e., asking stakeholders to call out ideas based on the interactive redesign process which were collected by writing on flipcharts. Facilitators also made brief notes about ideas on the flipcharts next to the ideas during the session. To ensure shared understanding of the ideas and properties generated, particularly when referring to respiratory care and healthcare terminology and jargon, clarifications of terms and words were requested. The flipchart pages were collected at the conclusion of the design sessions and kept in a secure space. Pictures of the flipchart pages were taken and stored in a password-protected drive.

Data were coded and analyzed using Atlas.ti cloud version, on a Mac Operating System. Atlas.ti cloud version was accessed using Google Chrome and Safari browsers. The initial step was to code the preliminary themes from the data. The components from all sections were tagged into codes and code groups (see Table 8). A total of 27 codes and 8 code groups were created. 13 codes were listed in two code groups, and one code was listed in three codegroups (see Table 9).

Table 9. Codes and code groups

Code Group	Code
Community Engagement	Community Engagement
Human Resources	Compensation and Benefits
	Competitive
	Recruitment
	Professional Growth
	Talent Acquisition

	Work-life Balance
Employee Well-Being	employee engagement
	Employee Safety
	Empowering
	Equitable Environment
	Professional Autonomy
	Professional Growth
	Research
	Respect and Value
	Work-life Balance
Organizational Culture	Respect and Value
	Professional Autonomy
	Innovative
	Interdisciplinary Collaboration
	Ledership
	Organizational Culture
	Feedback
	Empowering
	Equitable Environment
Financial	Compensation and Benefits
	Productivity
	Talent Acquisition
	Competitive
	Financial
Clinical Excellence	Excellence
	Research
	Patient is the Priority
	Patient Safety
	Quality Care
	Interdisciplinary Collaboration
Patient-Centric	Excellence
	Patient is the Priority
	Patient Safety
	Quality Care
	Patient Experience
	Interdisciplinary Collaboration
Regulatory	Regulatory

Table 10. List of codes in multiple code groups.

Name	Codegroup 1	Codegroup 2	Codegroup 3
Community Engagement	Community Engagement		
Compensation and Benefits	Human Resources	Financial	
Competitive	Human Resources	Financial	
employee engagement	Employee Well-Being		
Employee Safety	Employee Well-Being		
Empowering	Organizational Culture	Employee Well-Being	
Equitable Environment	Organizational Culture	Employee Well-Being	
Excellence	Clinical Excellence	Patient-Centric	
Feedback	Organizational Culture		
Financial	Financial		
Innovative	Organizational Culture		
Interdisciplinary Collaboration	Organizational Culture	Clinical Excellence	Patient-Centric
Ledership	Organizational Culture		
Organizational Culture	Organizational Culture		
Patient Experience	Patient-Centric		
Patient is the Priority	Clinical Excellence	Patient-Centric	
Patient Safety	Clinical Excellence	Patient-Centric	
Productivity	Financial		
Professional Autonomy	Organizational Culture	Employee Well-Being	
Professional Growth	Human Resources	Employee Well-Being	
Quality Care	Clinical Excellence	Patient-Centric	
recruitment	Human Resources		
Regulatory	Regulatory		
Research	Clinical Excellence		
Respect and Value	Organizational Culture	Employee Well-Being	
Talent Aquisition	Human Resources	Financial	
Work-life Balance	Human Resources	Employee Well-Being	

The definitions for each code group is as follows:

Community Engagement: This group included components engaging communities outside of respiratory therapy, including the public, other departments, etc.

Human Resources: This group included compensation and benefits and options provided to be competitive in the region.

Employee well-being: This group included aspects that are connected to employee well-being.

Financial: This group included compensation and benefits, departmental revenue, etc.

Organizational Culture: Several factors like empowering the employees, equitable work environment, feedback loops like patient surveys, leadership, and innovation are in this group.

Clinical Excellence: This group included components that impact and improve patient care.

Patient-centric: This group included care that is patient-centric, aiming at constantly improving patient care.

Regulatory: This group included components like licensure.

The data were categorized based on the following themes: Mission Statements, Value Propositions, Functions/Outputs, Processes, Structure, and Financial. The vision and mission statements refer to the purpose of the study, and address the “why” of this project. The functions or outputs refer to the “what” or the deliverables of this process. The processes refer to the “how” or the process of enabling the functions and outputs. The structure and financial themes refer to the governance and characteristics of the system. Together, these structures are built into the design spiral (Figure 36), which is based on the process proposed by Jamshid Gharajedaghi. Gharajedaghi (2011) refers to this process as “iterative process of inquiry for understanding complexity” (p. 93), which is shown in Figure 37. Gharajedaghi (2011) states, “Successive

iterations would yield a greater understanding and more closely approximate the nature of the whole.” (p. 93).

Figure 36. The design spiral

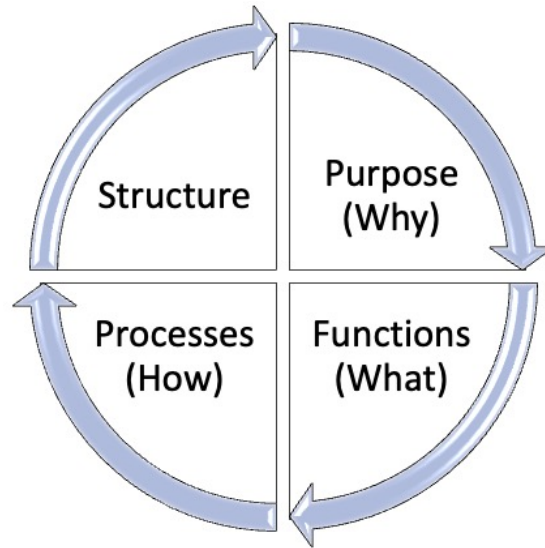
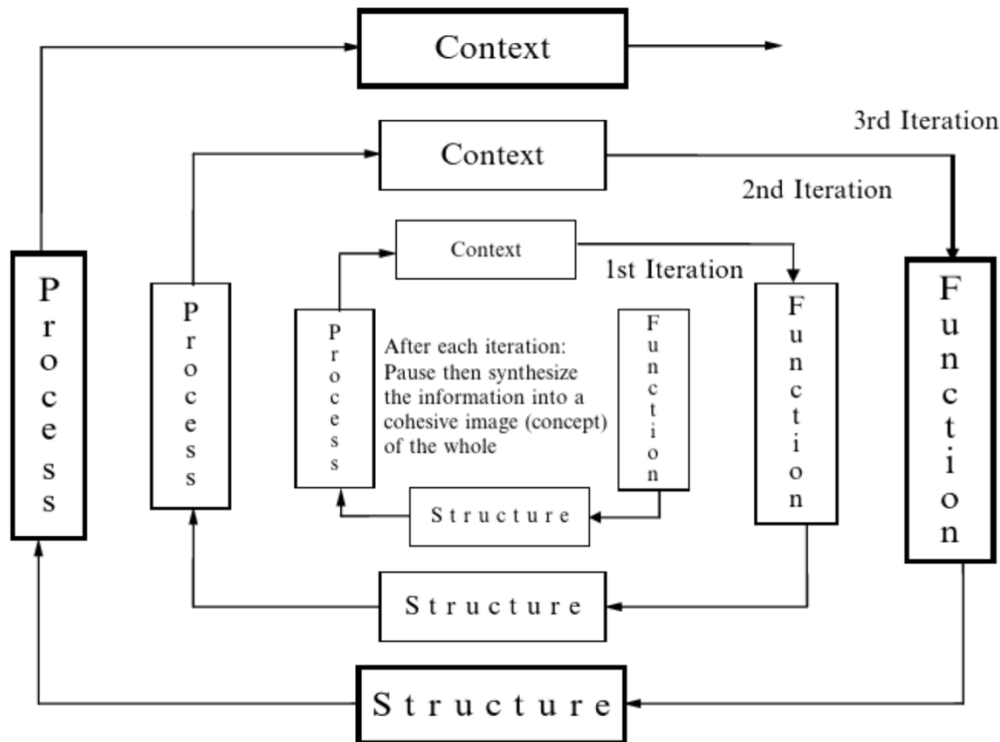


Figure 37. Iterative process of inquiry to understand complexity (Gharajedaghi, 2011, p. 93)



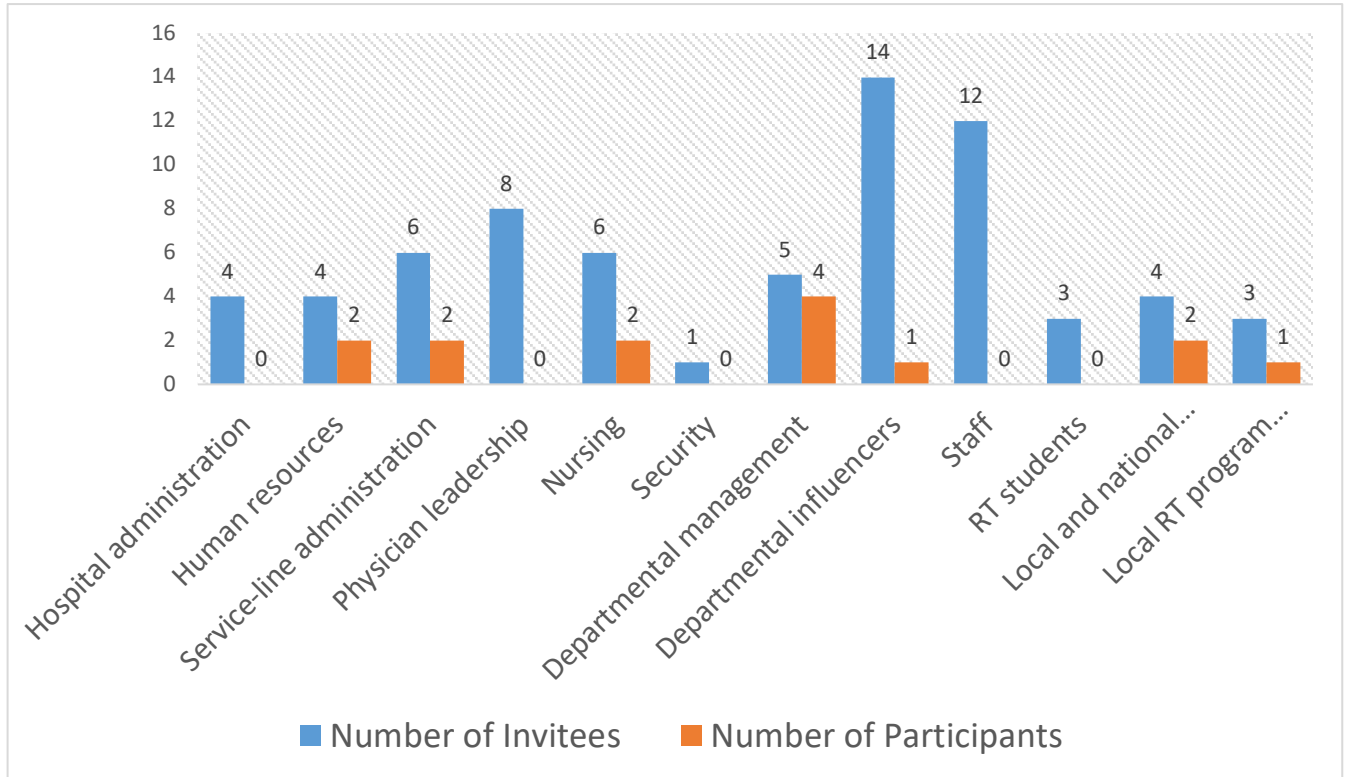
Stakeholders

As listed in Table 7, 70 stakeholders were invited to the interactive design session. Of these, 23 consented to participate in the design session, and 14 attended. This produced a sample size of $14/70 = 20\%$ of the identified population. A comparison of the number of invitees to the number of participants is listed in Table 11 and Figure 38. The following categories had no representation: Hospital administration, physician leadership, security, and RT students. The staff category representing respiratory therapy departmental staff had no participants, but the departmental influencers category with one participant overlaps to the staff category.

Table 11. List of participants

Category	Number of Invitees	Number of Participants
Hospital administration	4	0
Human resources	4	2
Service-line administration	6	2
Physician leadership	8	0
Nursing	6	2
Security	1	0
Departmental management	5	4
Departmental influencers	14	1
Staff	12	0
RT students	3	0
Local and national organizational representatives	4	2
Local RT program representatives	3	1
Total	70	14

Figure 38. List of invitees to participants comparison chart



Properties of an Ideal System

The facilitators asked stakeholders to describe elements for the design of an ideal system of retention within a respiratory therapy department. The following categories and elements reflected this process.

Question 1 A. Mission Statement

Participants were first asked to create a mission statement for the ideal organization to exist. (Ackoff, 2001). The vision and mission statements address the “why” of the design. To help frame this requirement, participants were told the mission statement should have the following components:

(a) identify the way(s) by which the organization will seek to be effective and unique, (b) unify all its stakeholders in the pursuit of one or more common purposes, and once formulated, (c) make a significant difference in what the organization does, and (d) make progress toward the organization's objectives measurable (Ackoff, 2001, p. 8).

To help formulate statements, examples of mission statements from well-known organizations were provided (Appendix F). For example, **Starbucks**: To inspire and nurture the human spirit – one person, one cup and one neighborhood at a time; **Walmart**: To save people money so they can live better.

To develop mission statements, both groups first identified important components of the mission statements (Table 12). The list was prioritized by participants during the second section of the planning session.

Table 12. Mission statement components

Collaboration
Work-life balance
Adequate compensation and other benefits
Striving to make every breath easier
Valuing each other
Giving autonomy
Growth from within
To be competitive with those around us
Using our voices, empowering

From this synthesis of elements and characteristics, four mission statements were developed by the groups. These were (1) To provide high-quality respiratory therapy with an interdisciplinary team approach to care while practicing at the top of the RT license and fostering professional development; (2) To make the employee the priority who in turn makes the patient the priority

by offering professional development and growth in what is meaningful to them; (3) To inspire and build better quality of life one breath at a time through collaborative relationships; and (4) To provide specialized better quality of life through better breathing.

Question 1 B. Value Proposition

To support the mission of the ideal system, stakeholders were asked to generate a respiratory therapy value proposition. The list of components that emerged during the interactive planning session is listed in Table 13.

Table 13. Value proposition components

Adequate time to do effective respiratory care
Adequate resources (cafeteria open, parking, safety, money)
Specialized care
Acknowledgement, respect for profession
Time for self-care, improvement, growth, professional development
Important and valuable
Human Touch
Staff feels cared for
Adequate equipment
Professional development, Growth
Collaboration, Relationships
Experts
Quality care, Quality/central/imperative
Respective, Mutual respect
A leaders that listens and is approachable
Culture of hospital
Servant leadership model
True Respiratory Assessment
Open engagement in the entire environment
System built around patient care
Create pipeline to increase staff
Well-being
Reimbursed
Safety
License issue

Not transactional
Better breathing
Deliver breathe, Enables respiratory effectively
Breathing life
Equality
Inclusive
Execution
High quality
Leader values team so they can share value to patients
Hospital makes therapist a priority

Based on these elements, four value proposition statements emerged at the planning sessions. These were (1) Our value is that the employee is the priority who in turn makes the patient the priority by offering professional growth and collaboration in an equitable and inclusive environment; (2) The value that we deliver is created through culture, safety, professional growth and respect; (3) The value that we deliver is created through collaboration; and (4) We value the prioritization of employees by offering professional growth and collaboration in an equitable and inclusive environment where the patient is the priority. A word cloud was generated using atlas.ti software using mission and value proposition components (Figure 39).

Figure 39. Mission and value proposition components

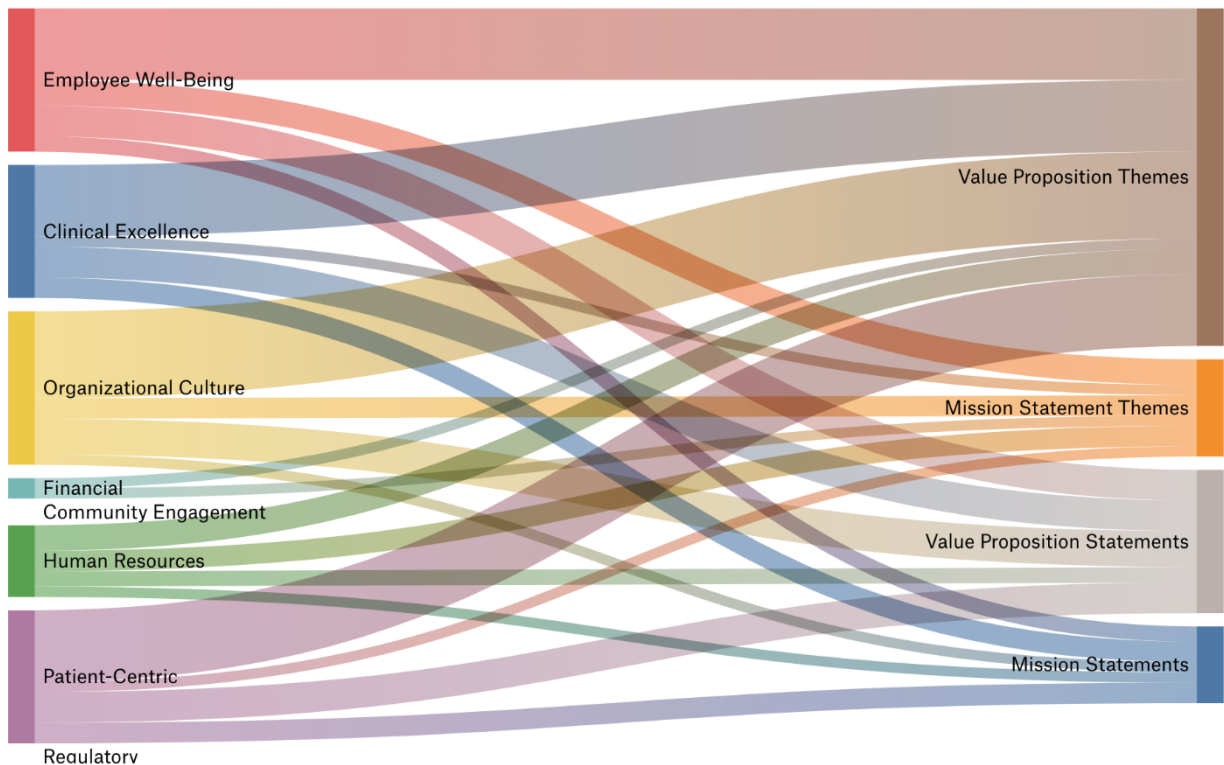


The word cloud demonstrates the importance to the stakeholders of concepts of growth, patient care, quality, value, collaboration and development.

Figure 40 is a Sankey chart of the code groups represented in each of the components in the mission and value proposition segments. A Sankey chart is a visualization used to depict a flow from one set of values to another. The things being connected are called nodes and the connections are called links.

Six code groups were identified. These are employee well-being, clinical excellence, organizational culture, financial, patient-centric, and human resources. Community engagement and regulatory are not identified in this section. A stronger presence of these themes in the value proposition discussion is evident.

Figure 40. Mission and value proposition Sankey chart



Question 2. Functions and Outputs

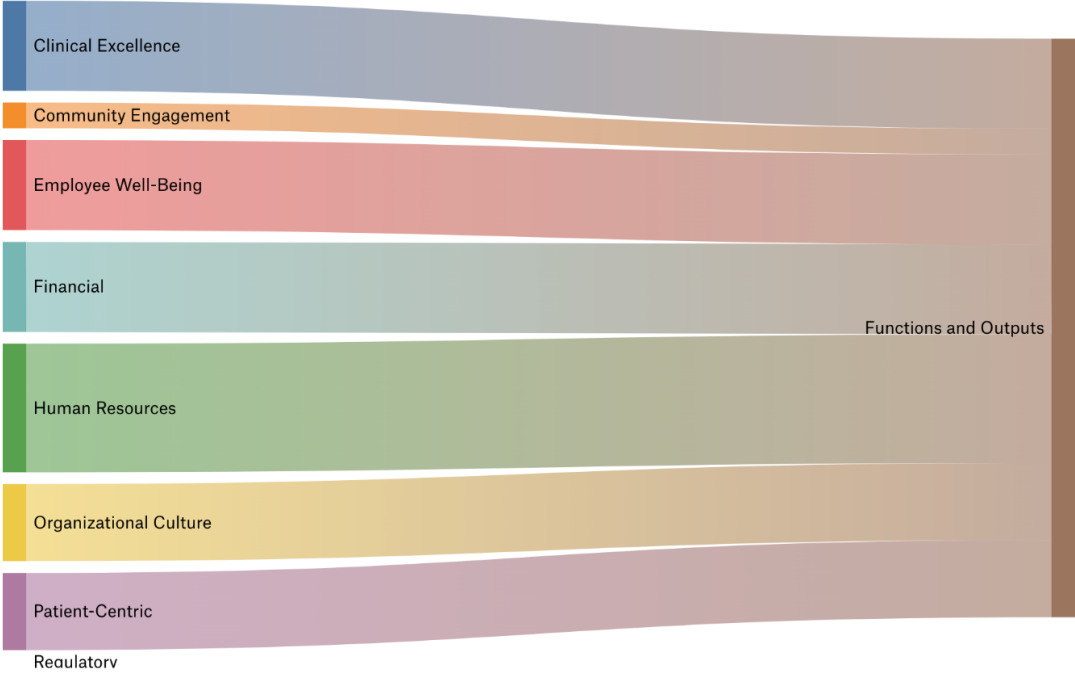
The following functions and outputs emerged at the planning session (Table 14). The functions or outputs refer to the “what” or the deliverables of this process. This is the list of properties identified by the participants during the discussion. Figure 41 is a Sankey chart representing the code groups identified in the functions and outputs sections. All code groups except regulatory are mentioned in this section. Human resources is highly represented in this section. Employee well-being, financial, and clinical excellence are equally represented. Some components in the financial code group overlaps with the human resources code group there by adding higher importance to those categories.

Table 14. Functions and Outputs

Increased morale
Increased involvement
Increase in RT staff education
Promotion of the Profession
Increase retention
Increase enrollment in RT programs
Highest Wellbeing
Staff Engagement
Quality Patient Care
Setting Standard
Increase patient safety
Increase patient satisfaction
Generate more ideas for research
More time to spend with staff
Successful in retaining Staff
Speciality care
Fully staffed
Endowment for future program
Self accomplished
Increase productivity

Waitlist for Employment

Figure 41. Functions and outputs Sankey chart



Processes

The processes refer to the “how” or the process of enabling the functions and outputs. The longest list in the planning sections emerged from this section, which comprises 80 properties from both groups with some overlap, reported in Table 15. This section had the most number of components generated compared to other sections of the planning. Certain overlapping themes have been combined. Figure 42 is a word cloud representation of the components. Resource, career, job, program, staff, and recognition are key words identified in this section. Figure 43 is a Sankey chart representing the identified code groups in this section. All components in the code group except regulatory are represented in this section. Human resources and employee well-being are equally represented in this section.

Table 15. Processes for the ideal system

Educate others about RT to increase respect for the profession; Create an internal pathway to outreach about career; Brand/career ambassadors
Advancement of clinical practice, Advanced practice resources
Increase recruitment statistics (high school shadowing, job fairs, healthscience programs at high schools)
Clinical ladder
Safe work environment (parking, working in the city, visible security presence)
Equity of value recognition
Culture; Temperature check on culture
Top leader buy-in and support
Shadowing of students going to high school
Inclusion in decision
Mentorship
Transparency on job grade and salary
Leaders experience on job
Staff development resources
Adequate staffing assignment - acuity
Job 2: Clinical scholar/instructor stipend
Separate staff for student clinical instructors
Didactic days with instructors
Adequate staffing to support the clinical schedule to maintain work life balance across the department staffing spectirum;
Rich educational environment
HR to build growth opportunity
Pathway to advanced degree
Clear consideration of advancement
Have committee involvement
Dedicaton of all department to buy in value
Work with EVS manager
Work with non clinical to recruit
Student RT license, temp practice permit
Practicing to top pf license
Transparency
Tuition forgiveness
Specialized knowledge of every level with rational opportunities
Empowered to be a change agent
Travel budget
Incentive to work

Shadowing boss/shadowing employee
Specific programs for quality improvement
Mortgage subsidy
Career pathway program with employment commitment
Dedicated quality and safety specialist
Maintain staff to participate in activities
Increase rt in media
Support by staff
Stipend to students/tuition pay for employeers 3 years
Allow non professional employees to apply
Training equipment resource
SEAL team resources/floaters
Externships
Connect with people
Specific program for research
Change in work hours to help with work life balance
Non-clinical growth days
Training for residents/multidisciplinary team
Rewamp selection process
Adequate leadership for each RT speciality area
Authorship, academic productivity, recognition
Patient surveys
Recognition of service
Training for different skill sets
Adequate resourses
Autonomy to make decisions
Parttricipate in innovation of care
Participate in leadership decision and selection of leader
Proves improvement
Variability clinical skill
1:1 meetings
Develop a path to learn about career
Create relationships with universities and programs
Recruitment pipeline
Policy on policy
Skills assessment for those interested yearly
Job fair
Career goals assessment with manager annually
Structure throughtout

Process to maintain real estate
Instructions to wirh with speciality teaching 1
Equality of recognition - customer service, monthly, quyarterly
Update equipment (ventilators, other machines)
Orietation resources

Figure 42. Processes components word cloud

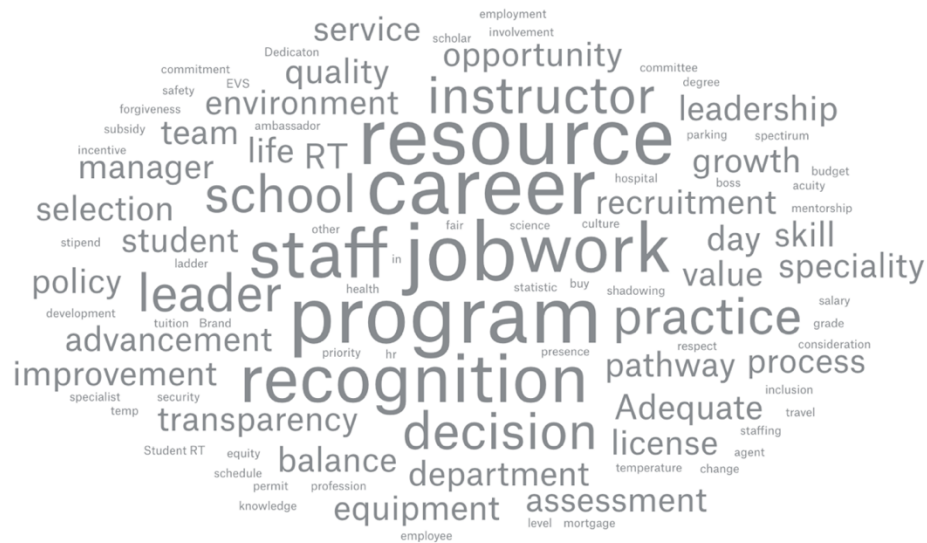
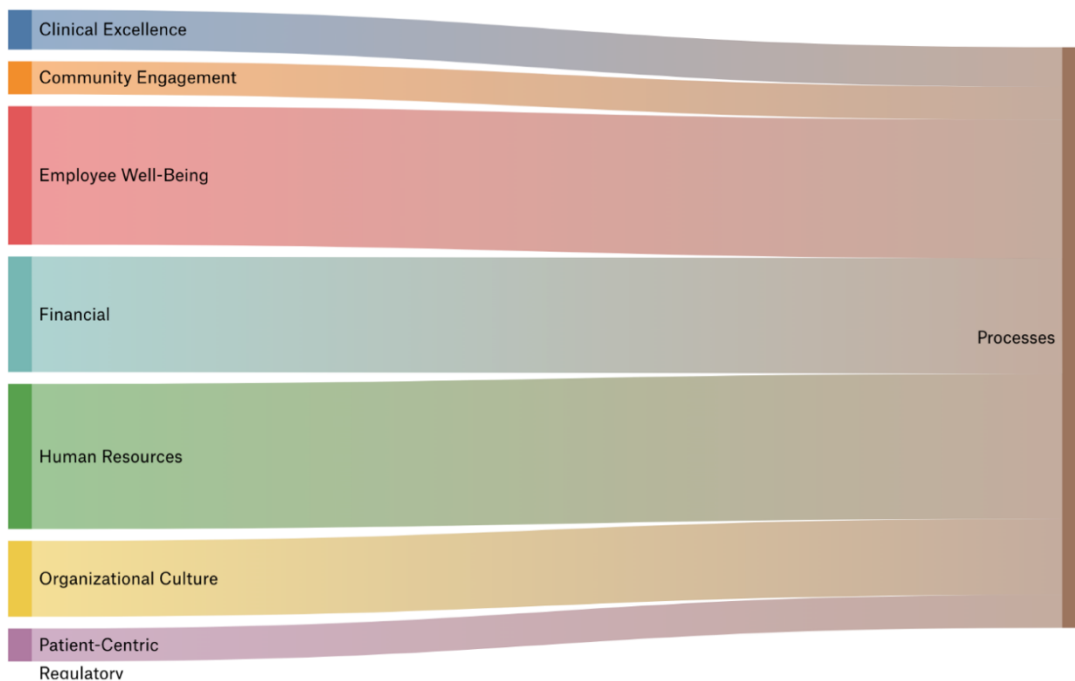


Figure 43. Processes Sankey chart



Structure and Financial Plan

The structure and financial themes refer to the governance and characteristics of the system. Components of the structure of the system are listed in Table 16. The financial plan was discussed during the session. The structure and financial themes refer to the governance and characteristics of the system. The participants were aware of the limitations in managing the budget but were asked to be open and unrestricted about the suggestions. The list of items that emerged is listed in Table 17.

Table 16. Components in the structure of the new system

Clinical ladder
APRT
Legislation to change designation
Develop heirarchy
Rexamine tenure/performance structure
Credential
Compact License
Legislation

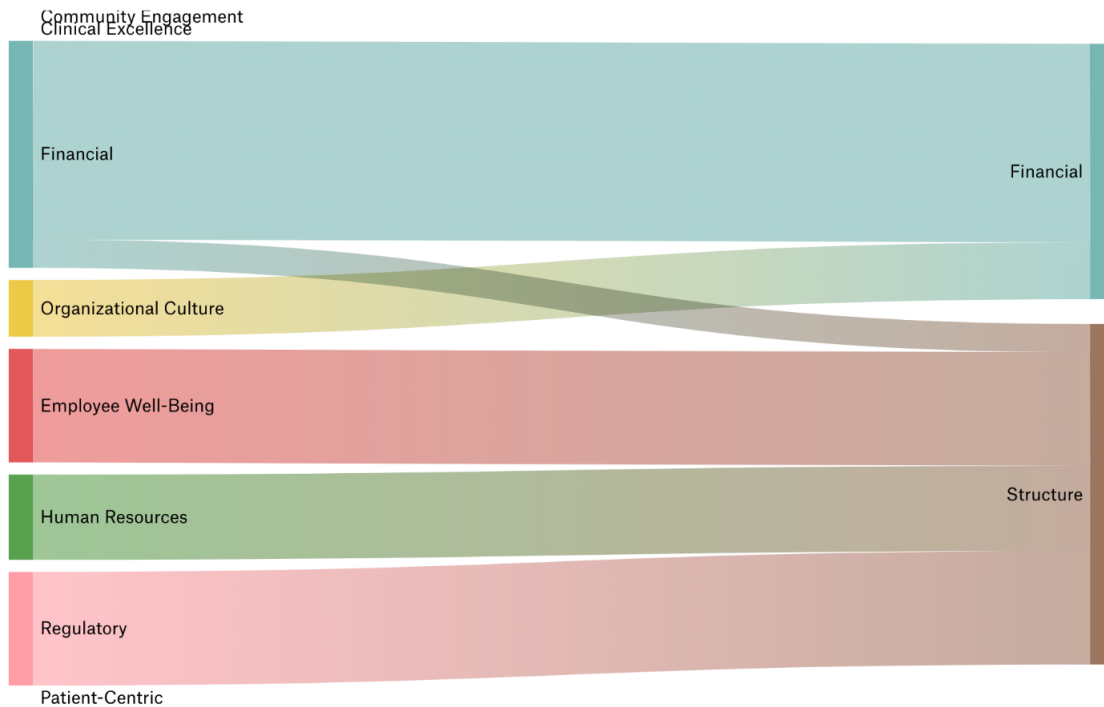
Table 17. Financial plan ideas

Programs that goes to home
Reimbursement for specialized services
Not drug or cpt based
Revenue for colleges and universities partnerships
Mobile pulmonary truck - value to promote in all settings
Endowment - ask for donations
Charge by value for patients - outpatient services
Charge for treatments by providing correct care evaluation

Figure 44, a Sankey chart representing structure and financial plan shows the following codes not represented in this section: community engagement, clinical excellence, and patient-centric.

Financial category has the highest representation in this section.

Figure 44. Sankey chart representing structure and financial plan



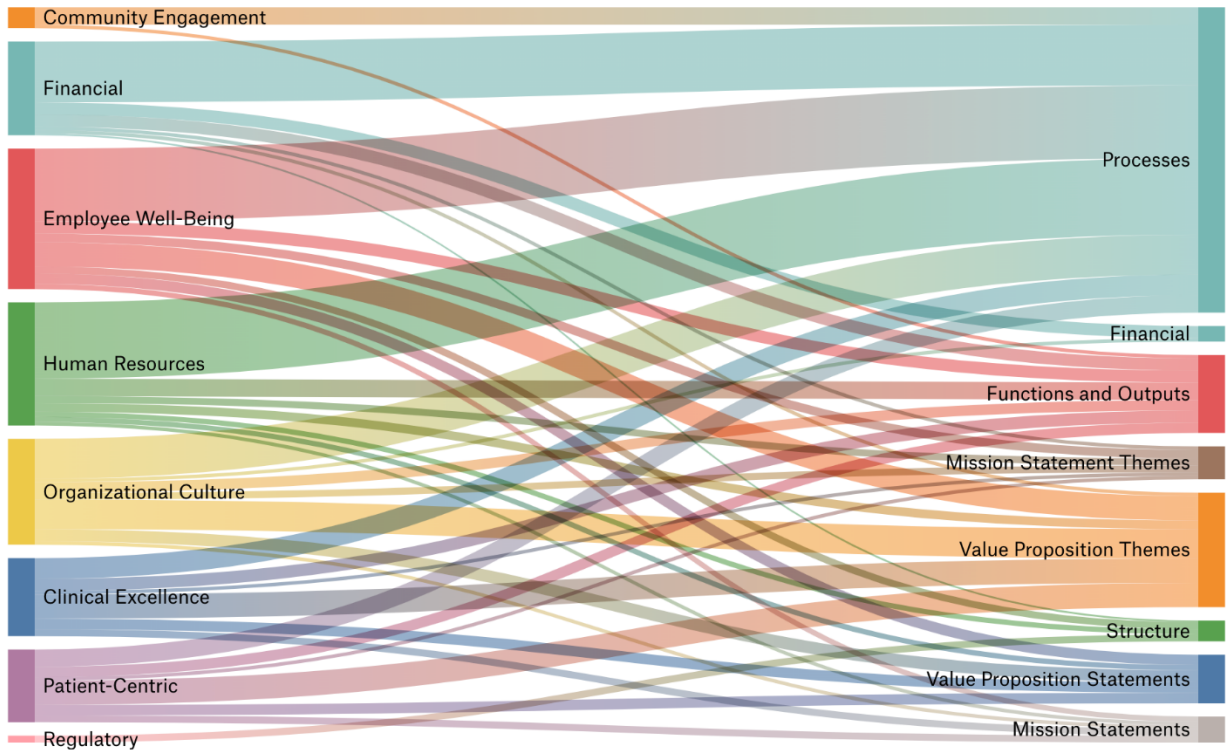
Summary of Results

A summary representation of the components from the interactive design session is depicted in Figure 45 as a word cloud. Figure 46 is a Sankey chart representation. The words growth, care, staff, and quality are the most mentioned. In the Sankey chart, employee well-being is the most commonly reflected code group. Human resources is the next most represented code group, followed by organizational culture and financial code groups.

Figure 45. Interactive design session word cloud



Figure 46. Interactive design session sankey chart



A summary list of the highest-represented codes used is shown in Figure 47. A total of 169 quotations were tagged with codes. Table 18 provides numerical data on the number of times these codes were used in all the sections and the percentage of times these were used in all the documents. Professional growth is presented in an overwhelmingly high number of times (24%), in comparison to the following quotes in within the 10% to 13% range, which are Respect and Value, Excellence, Financial, Quality Care, Organizational Culture, Talent Acquisition, Compensation and Benefits, and Empowering.

Figure 47. Summary chart all codes

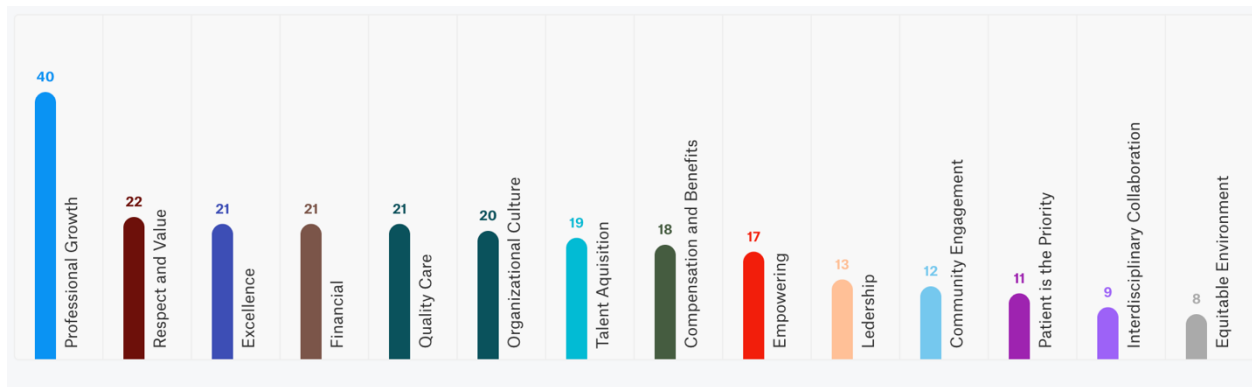


Table 18. Summary of all codes used

Code	Number of quotations per code	Code/total number of quotations
Professional Growth	40	24%
Respect and Value	22	13%
Excellence	21	12%
Financial	21	12%
Quality Care	21	12%
Organizational Culture	20	12%
Talent Acquisition	19	11%
Compensation and Benefits	18	11%
Empowering	17	10%
Leadership	13	8%
Community Engagement	12	7%
Patient is the Priority	11	7%

Interdisciplinary Collaboration	9	5%
Equitable Environment	8	5%
Patient Safety	8	5%
Productivity	7	4%
Work-life Balance	7	4%
employee engagement	6	4%
Regulatory	4	2%
Professional Autonomy	3	2%
Research	3	2%
Competitive	2	1%
Innovative	2	1%
Employee Safety	1	1%
Feedback	1	1%
Patient Experience	1	1%
Recruitment	1	1%
Total number of quotations	169	

Professional Growth is part of code groups Human Resources and Employee well-being. Respect and Value and Empowering codes are part of code groups Organizational Culture and Employee Well-being. Code Talent Acquisition and Compensation and Benefits are part of code groups Human Resources and Financial. Excellence and Quality Care are codes in code groups Clinical Excellence and Patient-centric. Organizational Culture and Financial are a code and code group. In this list of codes represented 10% or above, code groups Human Resources, Employee Well-being, Organizational Culture, and Financial are represented two times. Code groups Clinical Excellence and Patient-centric are represented one time.

CHAPTER 5

DISCUSSION

Papanagnou et. al. (2021) noted the increasing complexity in medical practice, and highlighted the need for complex systems thinking approaches to better define and comprehend the environment. The guiding purposes of this dissertation were to identify the challenges to retention of respiratory therapists coproduced by the COVID-19 global pandemic and define the issue of retention of respiratory therapists from a systems thinking approach. This was followed by an application of the systems methodology of interactive planning and idealized design to dissolve the retention challenges. As noted by Pourdehnad, Wexler and Wilson (2011, p. 7), “Interactive planners believe the future is subject to creation. They believe the best means of revealing a desirable future is by enabling the stakeholders to do it themselves.” In this systems-informed approach, people are empowered to create the world they are to live in through this process. (Ackoff, 1999b). The outcome of this formulation and intervention was to enable stakeholders to generate the properties for a prototype design of a new system in which past and current problems of staff retention are dissolved

This dissertation addressed these issues by asking the following questions:

1. When the challenge of respiratory therapy staff retention is formulated as a complex systems problem, what differences in understanding emerge compared to the prevailing analytic approach of problem formulation?

2. When the challenge of respiratory therapy staff retention is addressed using systems-thinking and design-thinking methodologies and tools, what outcomes and implications emerge compared to applying analytic and research methodologies and tools, the prevailing approach of problem solving?

The first question is addressed in Chapter 2 where the current retention literature is reviewed. It was identified that most retention literature is linear, analytical and reductionist. Studies refer to the components with minimal mention of the containing system or the inter-relationships between the components. Several studies did not had feedback loops, which is an essential component for systems to evolve. This led to looking at this problem from a systems thinking approach. Utilizing Snowden's Cynefin framework, retention is framed as a complex systems problem requiring a systems-informed approach to dissolve the problem.

The second research question is addressed in Chapters 3 and 4. Chapter 3 defined the methodology used to address the question, followed by Chapter 4 which presented the results of applying the methodology. An interactive planning session was held to develop an ideal respiratory therapist retention system. Stakeholders were identified and categorized in the influence-interest matrix (Figure 33) and invited to participate in the interactive planning session. Of 70 participants were invited, of which 14 (20%) attended the planning session facilitated by 3 faculty facilitators.

Prototype Design

The ideal respiratory therapy retention system as an organization must have a sense of purpose or reason for existence which is supported within a larger containing organizational system. This was conceptualized into a mission statement which defined the "organization's reason for being, its ultimate ends, its ideals." (Ackoff, 1999b, p. 82). The ideal retention system for respiratory therapists at TJUH should intentionally aim to retain respiratory therapy staff. This mission should align with the overall mission of the organization, which is "We Improve Lives." (Jefferson, n.d.). This ideal retention system therefore should ultimately improve lives by committing to the components that emerged from the interactive design session. Furthermore, the

system should align with its values of Jefferson, which are “Put People First,” “Be Bold & Think Differently,” and “Do the Right Thing” (Jefferson, n.d.).

Mission Statement

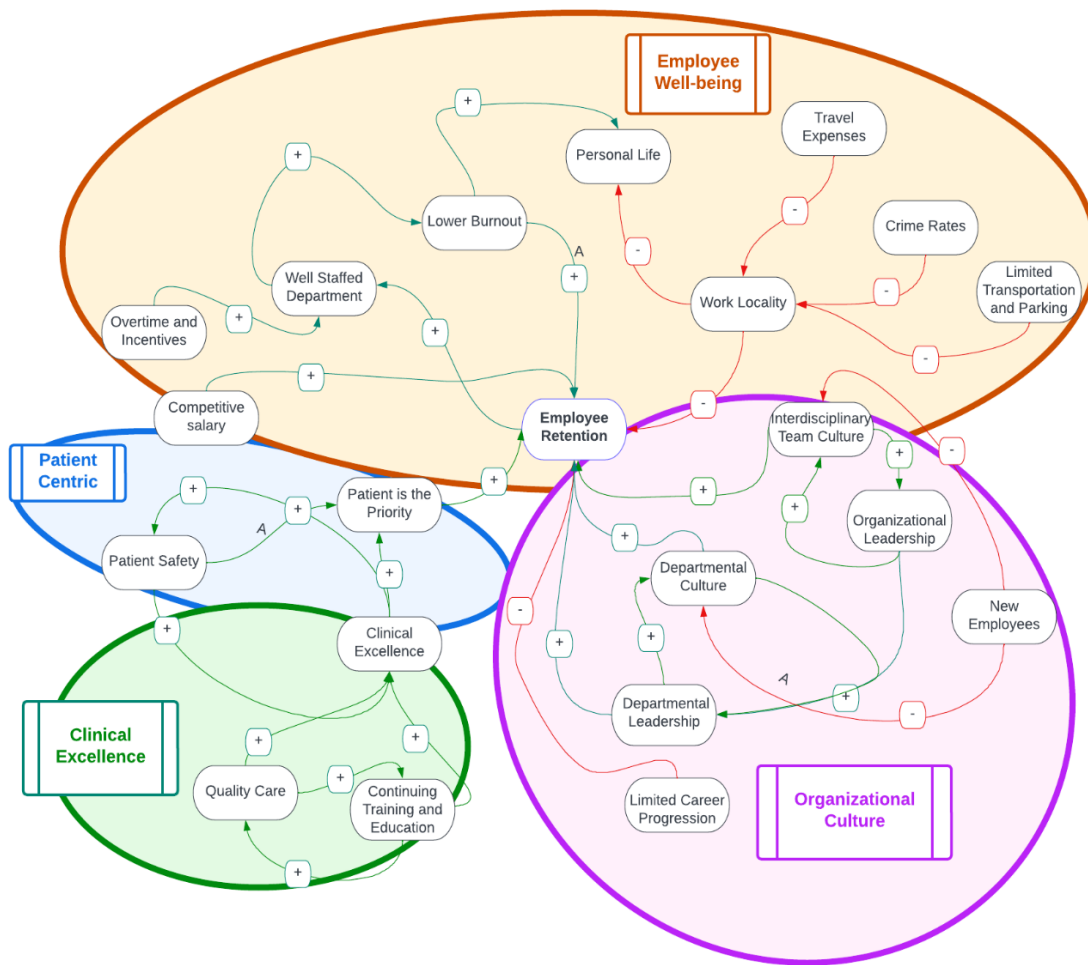
The mission and value proposition represents the “why” for the ideal respiratory therapist retention system. The Sankey chart (Figure 40) representing mission and value proposition had organizational culture as the highest represented code group, followed by clinical excellence, employee well-being, and patient-centric with equal representation. The codes in these code groups are: employee engagement, employee safety, empowering, equitable environment, excellence, feedback, innovative, interdisciplinary collaboration, leadership, organizational culture, patient experience, patient is the priority, patient safety, professional autonomy, professional growth, quality care, research, respect and value, and work-life balance. The ideal prototype mission incorporating the properties emerged from the interactive planning session, and Jefferson’s mission is “We improve lives by providing patient-centric clinically excellent services in a culture supporting employee well-being.”

Functions and Outputs

The functions and outcomes represent the “what” of the ideal respiratory therapist retention system. This ideal retention system highlighted components in the human resources code group at the most important group in the functions and outputs section (Figure 41), which included the following components: compensation and benefits, competitive, professional growth, recruitment, talent acquisition, and work-life balance. Other three major topics encompassing the four major themes, that is organizational culture, employee well-being, patient-centric and clinical excellence, are discussed. These are professional growth; respect and value; and patient-centric clinically excellent care. Figure 48 is an updated version of the

employee retention influence diagram (Figure 19) addressing the components that emerged from the mission and values section of the interactive design session addressing various components influencing employee retention. In Figure 19, patient and clinical excellence related components were not present, which are added based on the components identified during the interactive design session.

Figure 48. Updated employee retention influence diagram



Attract and Retain Talent. Talent acquisition and retention is a major component that is an essential function of this retention system. Respiratory therapy programs are low in enrollment nationally, and the number of graduates is lower. According to outcomes data

published by CoARC, in 2021, there were 72 graduates from four respiratory therapy programs in the Philadelphia metro region, located in Philadelphia, Chester, Delaware and Montgomery counties, serving hospitals in these counties and other areas like South Jersey, Delaware State, Bucks and West Chester counties (CoARC, 2023). These programs together are unable to sustain the staffing needs in the region. Hence, talent acquisition should not be a process of finding graduate respiratory therapists, but it should start with developing programs to attract students to healthcare careers, especially respiratory therapy, by developing pipelines from local high schools. Creative approaches to support students through their academic years by providing part-time job opportunities, stipends, and tuition reimbursement should be initiated. Furthermore, approaches to bring awareness to the profession to the upcoming workforce must be developed.

Organizational Culture. An organizational culture that values respiratory therapy is an important function and outcome of this ideal respiratory therapist retention system. A major theme emerged from this section is respect and value. Various subthemes emerged in this section. Respiratory therapists interact with the patient and several clinicals and departments. Figure 4 represents a summary of these interactions at TJUH. Respiratory therapists feeling respected and valued in all these interactions is an important component for retention.

Interprofessional teams develop respect and value for respiratory therapists during their interactions at the bedside, during teaching and training of respiratory modalities, and during organizational meetings. Engagement of the respiratory therapist at the bedside with other clinicians is an important aspect in developing respect and value in the organization. In other words, this process is mutual and systemic and is engrained into the culture of the organization. When this expectation is not met, it is often discussed among the interprofessional teams as a point of concern and necessary follow-up actions are taken.

Organizations where this culture is not existent may need to approach the change strategically and systemically. Organizational culture is complex, systemic, and holistic, which evolves and emerges over time. Ongoing retention issues cause team roles to evolve constantly across several disciplines, accelerating this emergence. (Papanagnou et. al., 2021). Snowden (2003) suggests leaders to “probe” to identify patterns of behavior and emergent properties among interacting components of the system. (p. 469). Leaders should act in the system with foresight and purpose, interactively, and should be aware of the ongoing cultural changes, changes in interacting parts, and the depth or layers of the structure. In hospitals, addition of a new attending physician brings changes to the practice, or mergers between institutions brings changes in priorities, both impacting the functioning of the department in different ways.

Patient-Centric Clinically Excellent Care. An essential function and output of the ideal respiratory therapist retention system is patient-centric, clinically excellent care. The mission of Jefferson is to “improve lives.” Respiratory therapists do this by providing their expertise in the clinical setting. The ideal system will focus on delivering excellent care through initial and ongoing staff training, identification and measurement of quality metrics, development of a culture of ongoing feedback, reporting of safety events, practice of evidence-based medicine, and developing opportunities to practice at the top of the license.

Processes

The processes represent “how” to fulfill the functions and outcomes of the ideal respiratory therapy retention system. Several components are listed here, fitting under the three main categories listed in functions and outputs, which are human resources, organizational culture, and clinically excellent care.

Compensation and Benefits. Several components encompass and overlap human resources section. Ongoing monetary rewards, compensation, market analyses, and payscale adjustment are important components of this retention system. Often, monetary adjustments are made as a reaction to an existing problem in identifying or retaining staff. Instead of being reactive, this system proposes an interactive system with an ongoing feedback loop that probes, senses and responds continuously. While market adjustment is a function of the human resources department, the local respiratory therapy leaders should be aware of the changing environment in the region through the development of relationships with leaders at other institutions. Respiratory therapists often work more than one job and are employed at more than one institution in the region. Hence, they are well aware of the rates, compensations, and benefits. An essential function and output of this retention system are appropriate and equitable compensation and benefits for respiratory therapy staff at TJUH.

It is evident that the systems should be competitive in the region, especially in comparison with other Jefferson health entities and other academic medical centers. Furthermore, equitable options in comparison to other clinical departments are also important. In health systems, nursing and physicians are highly valued, considering the number of staff in these departments. Hence, a high percentage of opportunities and resources are also available for these departments, ranging from dedicated departments for professional development, talent acquisition, research, training, and much more. Smaller departments like respiratory care do not have such dedicated resources or may have only a portion of these resources.

Professional Development. Professional development is one of the major themes that emerged from the interactive design session. Often, growth and development are used intertwined. Here, I would like to provide definitions for growth and development for clarity.

Growth is an increase in quantity and size: a cemetery can grow; people can grow larger by gaining weight and size. Development is an increase in quality, competency and learning: people can develop themselves; but no one and no organization can develop another person. These differences are important in an organizational context, where the organization cannot develop a person but can support the development of a motivated person focused on personal development.

The design for the retention of respiratory therapists emerged from the interactive planning session overwhelmingly listed professional development as a major component. Professional development overlaps organizational culture, employee well-being, patient-centric care, and clinical excellence. Several employee retention models listed in Chapter 2 mentioned this as a component of employee retention. Career ladder, speciality education, and leadership, opportunity to lead a specialty care area, clinical research and authorship opportunities, involvement in committees, and other opportunities to expand and find meaning at work, and some of the key themes in this section. In a study completed among respiratory therapists in New York, the following reasons were would to be the most common for respiratory therapists leaving the field: “a limited ability for growth/limited scope of practice” and “a lack of confidence in the future of the profession.” (Smith, et. al., 2017, p. 282-283).

Kacmerick and Walsh (2017) said respiratory therapy as a profession is at crossroads (p. 384). In the United States, respiratory therapy is still a profession requiring only an associate’s degree to enter into practice, compared to several other countries in North and South America, Asia, and Europe requiring baccalaureate level education to enter practice (Kacmerick & Walsh, 2017). The American Association of Respiratory Care (AARC), in conjunction with the Commission on Accreditation for Respiratory Care (CoARC) and the National Board of Respiratory Care (NBRC) developed a mandate to have new to practice respiratory therapists

starting in 2030 or later must have a baccalaureate-level education and RRT credential. (AARC, 2019). Since then, healthcare has seen even a dramatic evolution and emergence as COVID-19 has passed over the entire world, accelerating the previously existent issues in staffing.

Considering this change, CoARC has decided to amend the updated standards to continue to accredit associate's degree programs considering the ongoing workforce shortage. (CoARC, 2021). While this change was necessary to address the workforce shortage, CoARC advocates for current associate's degree programs to develop pathways for students to complete bachelor's degrees.

The completion of a bachelor's degree or an advanced master's degree in respiratory care is an option for practicing respiratory therapists. With no mandate from employers, accreditors, or legislative organizations, it is truly up to the individual's commitment to further education. The existing workforce crisis prevents organizations from adding such a mandate. Instead of a mandate, organizations can develop a system that would motivate employees to further their education and continue professional growth. Kackmerick and Walsh (2017) noted "professional apathy" among respiratory therapists, especially among managers as an important component of maintaining the dangerous status quo of this profession and suggested the consequences to be even pulling the profession back further from the advances that were made (p. 385). It is important for the system to believe and share in the purpose of professional growth. Advancing associate's prepared respiratory therapists to bachelor's prepared respiratory therapists is an essential component of professional growth. In nursing, several studies suggest improvement in patient outcomes in hospitals with a higher proportion of bachelor's prepared nurses. (Harrison, et. al., 2019).

Furthermore, the evolution of healthcare is always opening newer opportunities. Respiratory therapists are traditionally in acute care and critical care settings, dealing primarily with acute issues and crises. With the evolution of data-driven care, the increased focus on quality and safety, decreased costs, and nation-wide strategies to orchestrate more care in the outpatient setting, the respiratory care profession needs to evolve and adapt to fit in and acquire additional opportunities (Kacmarek, et. al., 2009). This will include not only developing newer and relevant programs in the respiratory care department but also opening up opportunities for respiratory therapists to expand beyond the department into spaces like quality and safety, healthcare information technology, research, administration, teaching, and more. Expanding to these additional roles requires furthering education from an associate's level to at least a baccalaureate level or even to graduate level. Additionally, building these components to the interview process to identify the right candidates, keeping these growth opportunities at the forefront of departmental discussions and decision-making, and a supportive culture for growth-motivated individuals must be maintained.

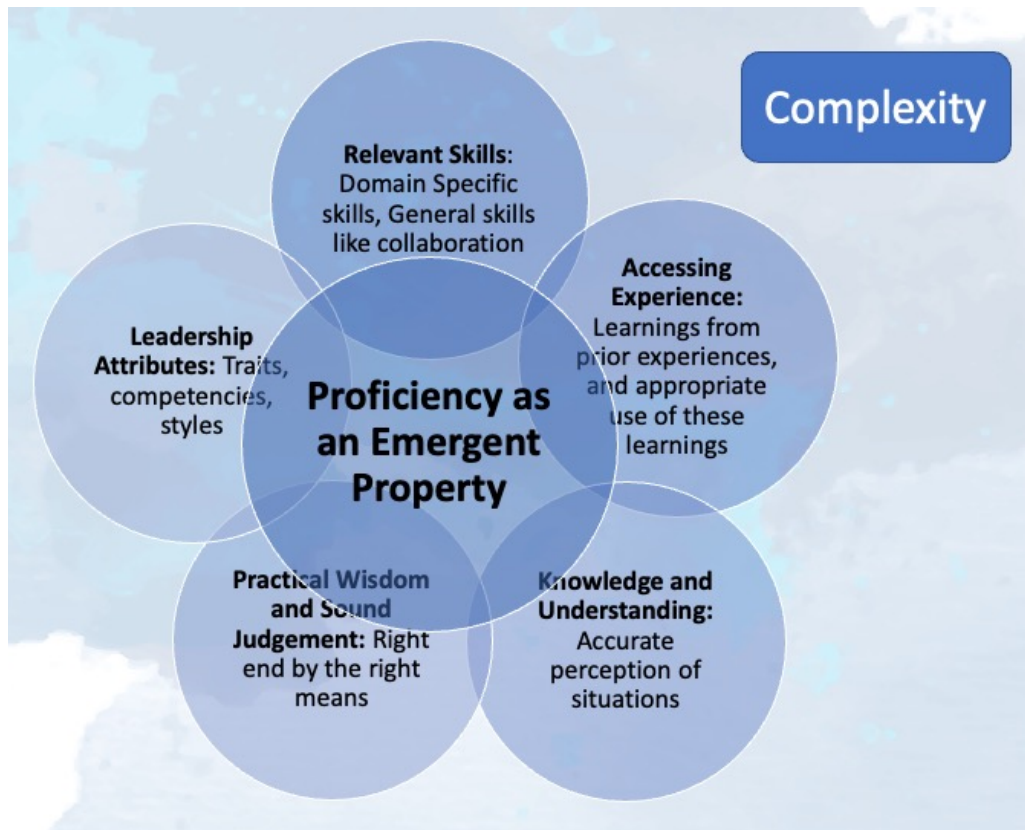
Practicing on top of the license for respiratory therapists varies depending on the institution. In some organizations, respiratory therapists are called only to follow orders or perform procedures and complete required tasks during the shift. At TJUH, most systems are highly protocolized and allow the respiratory therapist to be highly engaged and involved in the care of the patient. Therapists are expected to be on rounds to provide expertise, are encouraged to question and discuss concerns during clinical decision-making, and are sought out to offer expert advice specific to respiratory modalities and treatments and have autonomy in performing their duties. This structure is engrained in the system. New hires are engrained into this culture

during their initial months of working at TJUH, where they develop relationships with the interacting components.

Leadership Model. Thirdly, the practice of leadership in the organization is an important process. Leadership is not hierarchical, but persons with positions can influence the nature of leadership practice in an organization. As a leadership practitioner, I suggest a systems-informed leadership model for the ideal respiratory therapist retention system. Using the healthcare education context, Papanagnau et. al. (2021) discussed the lack of systems thinking mindset in current medical practice, and proposed the integration of complexity science into the curriculum. Similarly, in healthcare leadership, leader preparation and training to frame complex systems problems is necessary, where leaders will use tools like the Cynefin framework for sense-making and methodologies like interactive planning to dissolve problems. “Complex situations may have no definitive formulation of the problem because due to interdependencies, the problem is not understood until after the formulation of a solution.” (Starr, 2023, p 6-7).

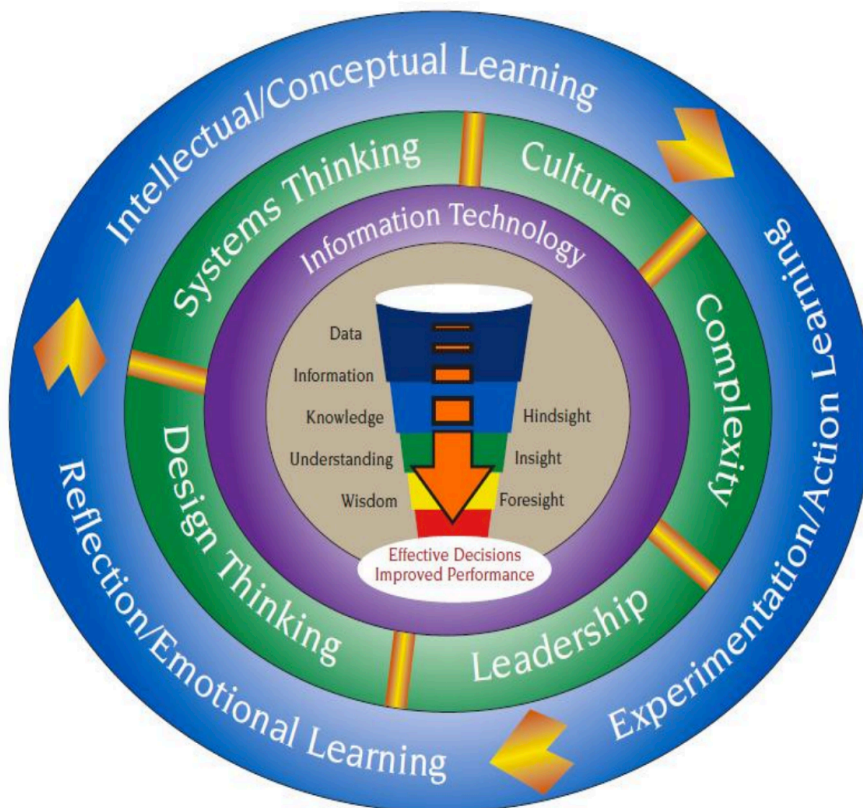
This dissertation framed the retention of respiratory therapists as a complex systems problem, which required not a reductionist or analytical approach but a systems approach. Complex systems problems are unique problems requiring unique responses from leaders. Pourdehnad and Starr (2014) suggested five components supporting leader proficiency, which is an emergent property of a complex system (Figure 49). These are relevant skills, personality attributes, accessing experience, practical wisdom and sound judgment, and knowledge and understanding. A leader’s response to problems is not an addition of these components but a result of the interaction of these components.

Figure 49. Leadership framework (adapted from Pourdehnad & Starr, 2014, p. 8)



Furthermore, a leadership learning model is an essential component of this system. Pourdehnad and Starr (2014) proposed a model for effective decisions comprising three concentric circles interconnected with components in each circle impacting decision-making (Figure 50). The proposed model is for an academic program but is applicable in this context with the exception of the lack of a structured system of learning covering these components to prepare leaders for effective decision-making, where the leaders are prepared to synthesize the system. Perhaps, the solution is to appoint or consult systems-informed leaders.

Figure 50. Model for effective decisions. (Pourdehnad & Starr, 2014, p. 11)



Structure

Career Ladder. Career ladders are structures in respiratory clinical settings with options for high-performing respiratory therapists to get recognized and rewarded for specialty certifications, completion of undergraduate and graduate degrees, and participation in and publication of quality improvement and research activities (Davis, 2023). These programs provide financial incentives along with recognition, which also increases departmental expenses. Clinical ladder is not a new concept. Different versions of this system have been in existence in hospitals since 1972. (Winslow, et. al., 2011). Respiratory therapy departments often borrow components from existing nursing clinical ladders, like the ladder system at Reading Hospital in PA. (Sauer, et. al., 2015). The purpose of these ladder systems is not just professional

development but is expected to improve the quality of care, reduce turnover which will support lowering departmental expenses and support better recruitment since the ladder is advertised as an opportunity for new staff. (Winslow et. al., 2011).

Several components that are part of a clinical ladder system are completion of bachelor's and higher level degrees, completion of certifications, earning additional credentials, participation in and publication of research, participation in departmental and interdisciplinary committees, local and national level participation, etc. Unfortunately, during the great resignation, several hospitals with clinical ladders also lost a high number of respiratory therapists even though previous studies have referred to a clinical or career ladder as a key component to retention (Smith, et. al., 2017). A clinical ladder system by itself is not a solution to retention efforts, but is a component of the larger system, which, if utilized well can support retention efforts.

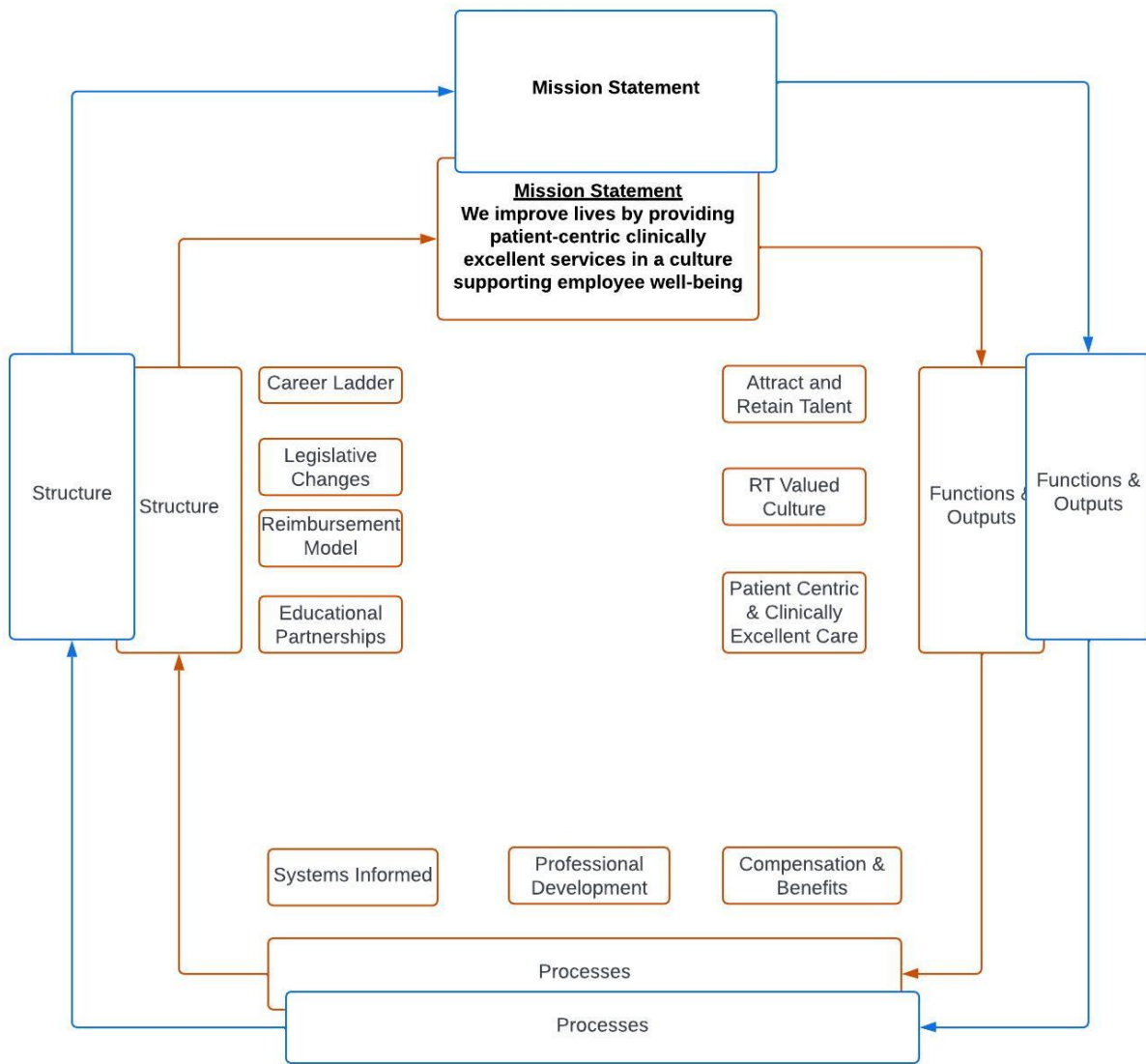
Educational Partnership. Development of educational partnerships with local institutions is multifocal. Clinical education is usually not reimbursed. At TJUH, clinical preceptors are not paid additionally. Building a structure that allows the staff therapist to be reimbursed for their expertise in teaching, and charging colleges for the time is a potential income source for the department to offer and support staff. Also, developing partnerships with educational institutions and students to offer tuition reimbursement or stipend is a good pathway to develop student commitment prior to graduation. This system can develop as a pipeline for potential new graduates. The program should have a minimum number of years of commitment after graduation. During this time, the department should work on training and building new respiratory therapists for clinical expertise and organizational commitment.

Other Items. Other items, like changes in the reimbursement model and legislative changes, will support the department financially. These changes are often state-wide or national. While local departments can advocate for these changes, the changes are not controlled or managed by these departments. On the other hand, changes in the external environment must be on the radar of leadership.

Ideal System Structure

Based on the interactive design process schematic (Figure 35), a model for the ideal respiratory therapist retention is prepared (Figure 51). The first square with the components is the first iteration of the ideal system. The system is built to evolve and adapt based on the changing environment, which will bring newer iterations of the system based on its evolution. The system is built for ongoing emergence and adaptation. The components are interconnected, influencing each other, and also capable of future iterations as the environment adapts and newer challenges are experienced. The components of this system are not linear in nature but non-linear and interdependent.

Figure 51. Ideal respiratory therapist retention system

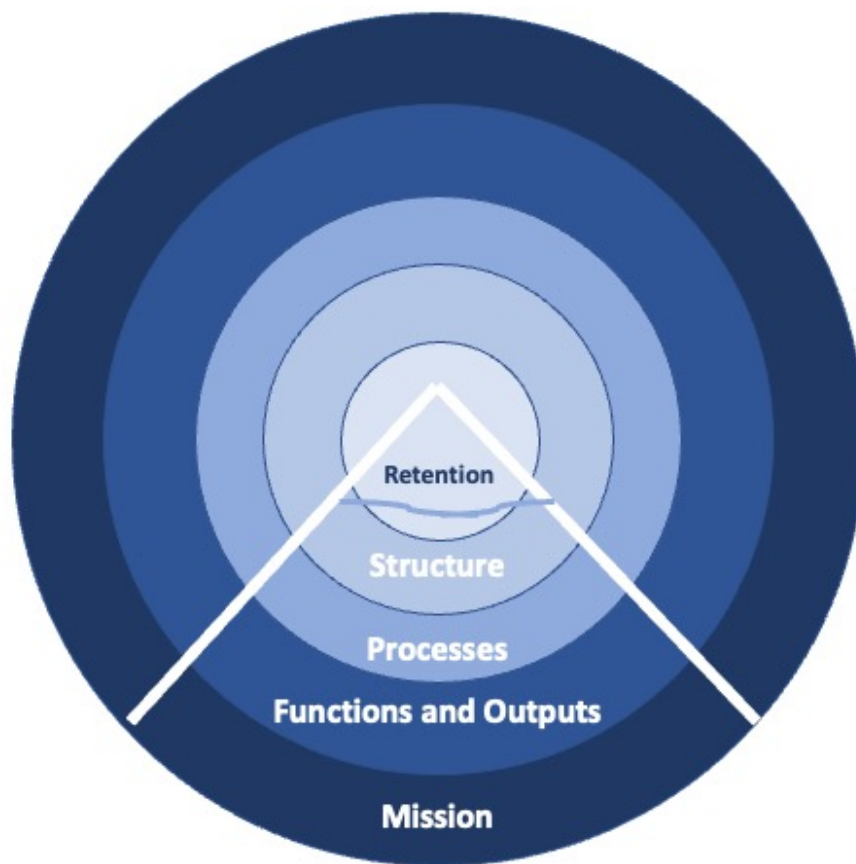


Implications of the Ideal System Model

An ideal system model is not a problem-free system where retention will automatically remain high. Instead, it is a system that has the structures built-in to adapt and evolve with the changes in the system, which is always evolving and adaptive. In the ideal system, all the components in Figure 51 are intertwined. The ideal system will be aware of these interactions. Figure 52 provides a systems view of the system, where the system is looked at from a top-down view of an iceberg. The outermost layer, mission, is the deepest layer of the iceberg. Retention, the smallest circle in the center, is the top and visible portion of the iceberg, which is the visible

outcome of the system. The white lines represent the boundaries of an iceberg to point out structures that are not often visible and are under the waterline. This system depiction proposes the structure not to be linear and lead into upper layers of the iceberg, but all of these components to be intertwined and interconnected, and not certainly contained only in certain layers of the iceberg. Changes in this system are not linear, and the results are not a sum of the changes but of the interaction of these parts. In the next few paragraphs, I outline some of the potential implications of organizational changes and the different ways in which these changes may impact the overall structure.

Figure 52. Iceberg view of the ideal respiratory therapy retention system



Changes in leadership are important to note. A change in a physician or a physician leader might lead to the therapist in that unit feeling less valued. Often, these behaviors are

spread to other roles with authority, like fellows and residents, slowly changing the culture not only at an organization but also at organizations where the graduating fellows and residents will eventually practice. With the majority of healthcare professions experiencing retention issues, it is common to see newer staff members in any given unit, some with experience and some as new graduates. Snowden's perspective on understanding these emergent properties on different levels is an important component for leaders. (Snowden, 2002). As departments and units evolve with newer staff members and leaders, the organization's culture is evolving and emerging. These changes are often not rapid. Leaders should follow such emergence by interacting with the parts of the system in different levels. Formal and informal staff meetings, collaborative meetings with other departments, etc. are examples but are productive only when the problem is looked at from a systems thinking mindset.

Changes in senior leadership often caused by turnover or mergers are another important component of this discussion. Senior leader support is an integral part of the successful progression of the department. The connection between senior leaders and the department is the layer of management. At TJUH, the management structure is a director, supervisors, and staff. The director and supervisors should be informed and engaged in advocating for respiratory therapy, as well as consistently bringing the value of respiratory therapists by meeting organizational goals, bringing innovative ideas, quantifying and publishing data, and staying relevant at an organizational level as well as at a state level and national level are important. An essential function and output of the ideal respiratory therapist retention system is to maintain the relevance of the profession in a highly volatile and emerging system.

When such changes occur, an analytic system responds linearly to a cause-and-effect structure, where the changes are isolated for discussions and changes. In a systems view, the

response is not linear. The responses in a complex systems world will cross several components of the system. These responses are unique to the environment and not standardized.

Comparison of the Analytic and Systemic Approach

In the earlier sections of this dissertation, I discussed the nature of complex adaptive systems, and retention of respiratory therapists as a systems problem, explained an approach to frame and dissolve the problem, and narrated the ideal respiratory therapist retention system that emerged from the interactive design session.

In traditional approaches to dealing with problems, root cause analysis and linear approaches are often utilized. These approaches identify one or few components as the reason for the existing problem, which is essentially reducing the system to parts and attempting to improve the parts. In this reductionist approach, problems are broken down into several parts for deeper analysis, and changes are made to this isolated part with the expectation of improving the function of the whole system (Starr, 2023). In reacting to retention issues, often an immediate and sadly only approach that organizations focus on heavily is compensation. These are done by sign-on bonuses, retention bonuses, market adjustments, and other monetary benefits. It is assumed that retention is directly and linearly related to compensation, and increasing compensation will improve retention. Awareness of the leaders and leadership to view the organization as a complex adaptive system is extremely important.

These systems and problems are complex, emergent, un-ordered, and non-linear in nature, which requires systems-informed tools and methodologies. The magnitude of the situation will vary based on the type of organization, mostly dependent on the interacting parts and the hidden or unknown culture, which cannot be replicated in organizational documents. The existing patterns understood through existing structures or previous knowledge are not enough in

the complex adaptive system. The patterns are emergent. The culture and mindset of the organizations evolve while functioning in a complex environment, and the relationships between the interacting parts emerge. Solutions that emerge from the use of systems-informed tools and methodologies are novel in nature and unique (Starr, 2023). These solutions cannot be replicated since each system is unique, and hence the solutions emerging are also unique.

My Expectation and Learning

During the initial days of COVID-19, especially as impact of the great resignation started reaching health institutions, the initial response was to respond by increasing compensation either by an adjustment to the base rate or through bonuses. During this phase, healthcare institutions across the country facing staffing shortages reacted to the situation by offering increasing amounts of compensation, especially for temporary staff willing to travel and work for a short 3-month or 6-month assignment. Local institutions increased base rates to retain and attract local talent. Often, the mindset was heavily set on increasing compensation as a major theme that could bring immediate results. Fortunately, turnover at TJUH was relatively stable (Table 1), representing the function of the system beyond just one component, which is compensation. Even though the turnover was not high, as a leader, it was my purpose to develop a system that was built to adapt and emerge to the current system as well as future changes and continue to retain and attract talent. Hence, a high rate of turnover was not used as a criterion to develop this system, even though turnover nationally became a key reason to explore this topic from systems thinking approach.

The interactive planning session provided several personal insights. These include the number of properties generated from the session and the development of these properties into a few major themes, specifically employee well-being, organizational culture, and clinically

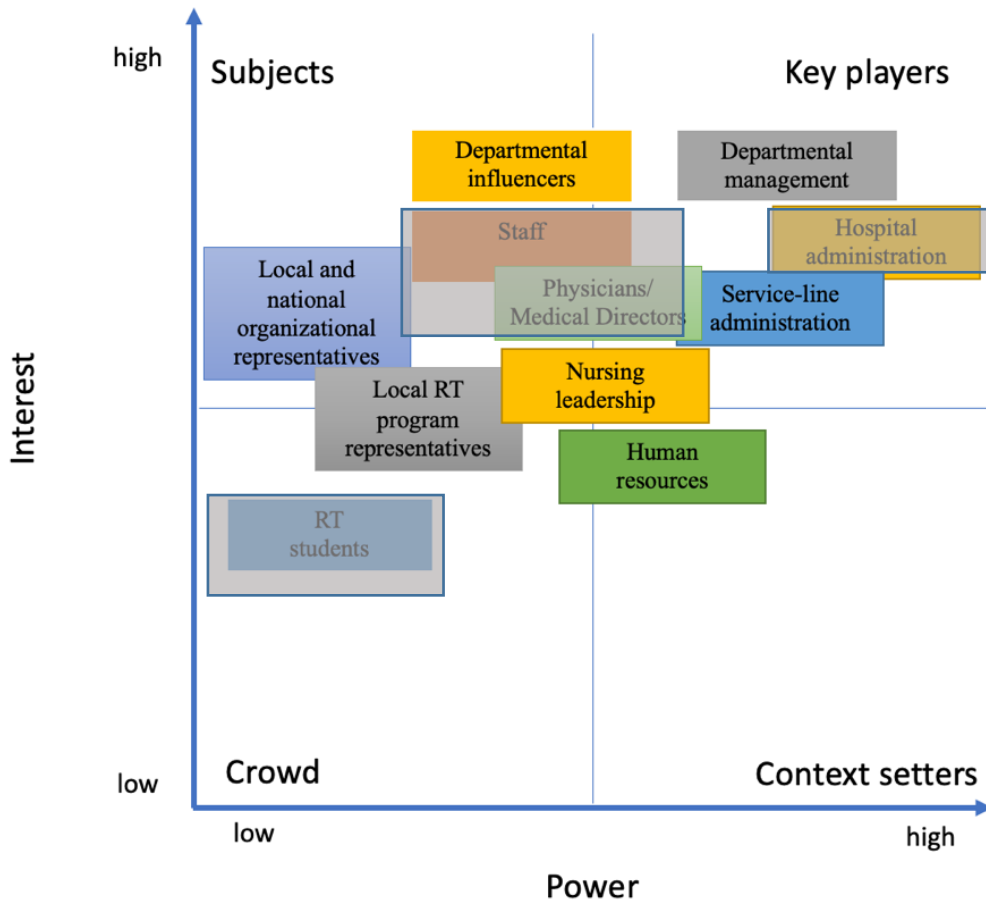
excellent and patient-centric care (Figure 48). The richness of properties that emerged from the interactive planning session is exceptional and surprising. Furthermore, the participants in random groups interacting and generating these properties was eye-opening. It was an investment for all participants to attend a half-day session during a regular work day, and their commitment to the institution and profession is incredible and empowering.

Thirdly, the lack of participation from members, especially night shift respiratory therapists and day shift staff respiratory therapists, is noted. Several factors influenced these decisions, like personal off days, vacations, child care, scheduled work day, etc., but most invitees responded to the invitation with their inability to participate. Their engagement in the process is empowering, and it will be ideal for gathering more information by creative and innovative approaches to capture additional properties for another iteration of the ideal respiratory therapy retention system.

Opportunities to Improve

The components of the prototype design were developed by 14 participants. Figure 52 is an updated influence diagram with the missing participant groups greyed out. These include RT staff, Physicians/Medical Directors, Hospital Administrators, and RT students. RT staff is a key component of an ideal retention system in a respiratory department. Four staff members consented and several canceled later. Perspectives from the staff are assumed to be partially captured from participants in the departmental influencers and departmental management groups.

Figure 53: Interactive design session participants



For several participants, the timing, length, and location of the session were a barrier. RT staff working 12-hour shifts were unable to either come to the location on their off day due to other obligations. Some of the consented RT staff picked up shifts at the hospital due to schedule needs. The primary reason for the lack of participation of physicians was schedule conflicts and their inability to spend four hours on a weekday morning. Offering a second and third interactive design session could generate additional components.

Respiratory therapy is an emerging profession. The perspective of a therapist working in the field for two or three decades is different from those who are newer to the field. As the field is emerging, the reason for joining and remaining in the profession (and at an organization) from a generational viewpoint is an important viewpoint to capture. While a few generations of

respiratory therapists were present, almost everyone in these groups was in some type of leadership role. Perspectives of bedside respiratory therapists in this category are an important part that was not captured.

There was no participation from physicians/medical directors. Three physicians responded to the study invitation stating their schedule conflict and inability to attend the session. Physician perspectives from the intensive care units where respiratory therapists function primarily at TJUH is an important component that was not captured. Similarly, four participants from the hospital administration consented to the study but were unable to attend the session due to a last-minute emergency. Perspectives of administration and senior leaders are an important component that was not captured. No responses were received from invited RT students.

Conclusion

This dissertation is important for the larger audience not to pull emergent properties from this design session to adapt at their own institutions but to utilize the complex systems mindset to view the problem and the interactive design process to develop solutions to dissolve problems. This dissertation is focused not on best practices but on the best process. In a nutshell, our complex environments need practitioners aware of and prepared in a systems mindset, looking at not to react or pre-act but to interact within the environment to bring unique solutions to dissolve the problems.

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APPENDIX A: Invitation

(Date)

Dear Invitee,

I am a doctoral candidate in the School of Business at Thomas Jefferson University. I am requesting your participation in a doctoral research study that I am conducting titled: *Respiratory Therapy Staff Retention: A Systems Thinking Approach*. The intention of this dissertation is to design an ideal model for retaining respiratory therapists at Thomas Jefferson University Hospital.

The study involves attending a live interactive session on January 13, 2023, from 9:00 a.m. to 1 p.m. at Bluemle Life Sciences Building Rooms 105 and 107. Participation is completely voluntary, there is no reimbursement or payment, and you may withdraw from the study at any time. No personal information will be requested or collected, other than your email, which is needed to acknowledge your voluntary participation.

During the workshop you will be prompted to offer suggestions and provide opinions only about respiratory therapy retention. If you would like to participate in the study, and be a co-designer of a new respiratory therapy retention system, please click on the link below indicating your consent to participate.

To agree to participate in the study, please follow this link: https://jefferson.co1.qualtrics.com/jfe/form/SV_5t1ogJOVZQGPsmG

If you have any questions, please contact me via email.

Sincerely,

Jerin Juby, Doctoral Student, Thomas Jefferson University
Jerin.Juby@Jefferson.edu

APPENDIX B: Consent Form



By providing my name and email below, I consent to participate in the "Respiratory Therapy Staff Retention: A Systems Thinking Approach" study.

Name

Email

APPENDIX C: Research Study Interactive Session Details

01/03/2023

Dear (Participant),

Happy New Year! Thank you for participating in my doctoral research study. The study is titled: *Respiratory Therapy Staff Retention: A Systems Thinking Approach*. The intention of this study is to design an ideal model for retaining respiratory therapists at Thomas Jefferson University Hospital.

As a reminder, the live interactive session is on **January 13, 2023, from 9:00 a.m. to 1 p.m.** Lunch will be provided.

1. Location: Bluemle Life Sciences Building, Rooms 105 and 107
2. Address: 233 S. 10th Street, Philadelphia, PA 19107

Watching the following video is recommended prior to the session but is not required.
<https://www.youtube.com/watch?v=spm2HUxgI30&t=880s>

If you have any questions, please contact me via email.

Sincerely,

Jerin Juby, Doctoral Student, Thomas Jefferson University
Jerin.Juby@Jefferson.edu

APPENDIX D: Design Session Agenda

9:00 – 9:30AM	<p>Set-up</p> <ul style="list-style-type: none"> • Welcome; Design of an ideal respiratory therapy retention system; Reasons for workshop; Workshop instructions
9:30 – 11:45AM	<p>Stakeholder Design Session Part 1</p> <ul style="list-style-type: none"> • Form three groups; In each review session guidelines – 10 minutes • Design session steps (mission, specifications, design) – 20 minutes for each item <ul style="list-style-type: none"> ○ Mission for the Ideal Respiratory Therapist Retention System ○ Value proposition for the Ideal Respiratory Therapist Retention System ○ Functions(Outputs) for the Ideal Respiratory Therapist Retention System ○ Processes for the Ideal Respiratory Therapist Retention System ○ Structure (Specification/design) for the Ideal Respiratory Therapist Retention System ○ Financial discussion for the Ideal Respiratory Therapist Retention System
11:45 – 12:30PM	<p>Shop Idea Market/Lunch Break</p>
12:30 – 12:45PM	<p>Stakeholder Design Session Part 2</p> <ul style="list-style-type: none"> • Combined group: Review, qualify, and prioritize ideas -
12:45 - 1:00 PM	<p>Closing remarks and next steps</p>

APPENDIX E: Participant Guidelines

- Current system was destroyed last night
- Larger containing system (JEFFERSON) remains intact
- Focus on what you want - your ideal
- Do not focus on what others should have or what is not wanted
- If you disagree with a statement, offer an alternative
- Do not worry about the likelihood of implementation
- Do not worry about resource requirements

APPENDIX F: Sample Mission Statements

Jefferson

We Improve Lives.

Jefferson College of Nursing

We improve lives through academic programs of excellence, exceptional clinical practice and community engagement, transformative research and inquiry, and far-reaching philanthropy.

American Associate of Respiratory Care (AARC)

The AARC is the foremost professional association promoting respiratory therapists.

JetBlue

Inspire Humanity

Nike

Bring inspiration and innovation to every athlete* in the world. *If you have a body, you are an athlete.

Starbucks

To inspire and nurture the human spirit – one person, one cup and one neighborhood at a time.

Walmart

To save people money so they can live better.

Whole Foods

Our deepest purpose as an organization is helping support the health, well-being, and healing of both people—customers, Team Members, and business organizations in general—and the planet.

Johns Hopkins Medicine

The mission of Johns Hopkins Medicine is to improve the health of the community and the world by setting the standard of excellence in medical education, research and clinical care. Diverse and inclusive, Johns Hopkins Medicine educates medical students, scientists, health care professionals and the public; conducts biomedical research; and provides patient-centered medicine to prevent, diagnose and treat human illness.

APPENDIX G: Facilitator Prompts

Icebreaker – Introductions – Why are you here?

1. What is the reason for being?/What is the mission of an *ideal Respiratory Therapist Retention System (RTRS)*? What is the “value proposition?”
2. What does an *ideal RTRS* provide?
3. What are the primary functions (outputs) of an *ideal RTRS*?/What functions must the organization perform in order to produce the outputs or achieve the mission?
4. Who are the customers (consumers)?
5. How should the *ideal RTRS* organization differentiate itself from its competitors?

APPENDIX H: OHR-34 Form

PI:
Page 1 of 2

OHR-34
Version Date: MM/DD/YYYY
Version Number: X.X

JEFFERSON—Office of Human Research

Research Not Requiring IRB Review: A Checklist

Version Date – FOR OHR USE: 11/11/21

STUDY TITLE: RESPIRATORY THERAPY STAFF RETENTION: A SYSTEMS THINKING APPROACH

PRINCIPAL INVESTIGATOR: Larry M. Starr, Ph.D.

TELEPHONE #: 215-951-5332 E-MAIL: Lawrence.Starr@Jefferson.edu

Instructions: Use this form as a checklist to certify that the research you intend to conduct fits completely into one or more of the following categories. These categories do not meet federal definitions of human subjects research as cited in HHS and FDA regulations at 45 CFR 46.102 & 21 CFR 50.3, respectively, and, therefore, do not fall under IRB purview and do not require IRB review.

Please check the applicable categories of research you intend to conduct:

- _____ (1) Scholarly and journalistic activities (e.g., oral history, journalism, biography, literary criticism, legal research, and historical scholarship), including the collection and use of information, that focus directly on the specific individuals about whom the information is collected.
- _____ (2) Public health surveillance activities, including the collection and testing of information or biospecimens, conducted, supported, requested, ordered, required, or authorized by a public health authority. Such activities are limited to those necessary to allow a public health authority to identify, monitor, assess, or investigate potential public health signals, onsets of disease outbreaks, or conditions of public health importance (including trends, signals, risk factors, patterns in diseases, or increases in injuries from using consumer products). Such activities include those associated with providing timely situational awareness and priority-setting during the course of an event or crisis that threatens public health (including natural or man-made disasters).
- _____ (3) Quality assurance or quality improvement projects in which the data collected will be used only to verify, alter or improve quality of care or efficiency within the Jefferson entity. (If external publication or public presentation of data is intended, project may require IRB review. Please consult with Office of Human Research)
- (4) Information-gathering interviews, questionnaires & surveys where questions focus on factual information and opinions about processes, services, or policies, and do not gather personal information about living individuals, or; research gathering factual information from source texts.
- _____ (5) Research involving cadavers, autopsy materials or bio-specimens from deceased individuals. Note: HIPAA does not exempt decedent research. Please complete and email the OHR-17 to the Privacy Office at privacyoffice@jefferson.edu.

- 50 _____ (6) Coded or anonymous private information or biological specimens that were not
51 collected originally for the currently proposed research and that cannot be re-
52 identified by the Investigator. (Note: This research requires that you submit OHR-
53 19 form to the Office of Human Research.)
54
- 55 ___X___ (7) Research that does not involve collection of private information about living
56 individuals. (This category excludes observation of public behavior, which is
57 considered a category 2 exemption, for which you should submit OHR-18 to the
58 IRB.)
59
- 60 _____ (8) Research where Jefferson is not engaged in the research. Examples of this
61 include: when Jefferson’s employees or agents 1) act as consultants or provide paid
62 service for research but at no time obtain, receive, or possess identifiable private
63 information, or 2) inform prospective subjects about the availability of research.
64 (Note: this is not a complete list of examples.)
65
- 66 _____ (9) Case reports of one or two cases. (Three or more case reports in one series
67 require IRB review). While one or two case reports do not require IRB review,
68 they do require review by the Privacy Office.
69
- 70 _____ (10) Collection and analysis of information, biospecimens, or records by or for a
71 criminal justice agency for activities authorized by law or court order solely for
72 criminal justice or criminal investigative purposes.
73
- 74 _____ (11) Authorized operational activities (as determined by the relevant federal
75 agency) in support of intelligence, homeland security, defense, or other national
76 security missions.
77
78

79
80
81 **By signing below, the Principal Investigator certifies that the entirety of his/her**
82 **research fits into one or more of the above categories.**
83

Larry M. Starr

September 1, 2022

84
85
86 Principal Investigator

Date

87
88
89 **WRITTEN DETERMINATIONS**

90
91 If a determination is required by a funding agency or sponsor, the investigator may submit
92 a request for written confirmation along with the OHR-34 to the IRB, which will provide
93 a written response.