

NEED FOR ENRICHING SOCIAL SITUATIONAL AWARENESS

Awareness of one's social surroundings is important in various aspects (both personal and professional aspects) of people's everyday lives. Social situational awareness, as described in Figure 1.3 can have tremendous impact on the quality of one's life and also on their ability to relate to their social surroundings. In this chapter, we introduce three important areas where there is an increased need to enrich social situational awareness: From the scope of disability being a hindrance to receiving social signals, to weakened medical team through communication breakdown, we assess the importance of social situational awareness and discuss how enriching the social signals could positively benefit personal and professional interactions.

(1) where a person with a disability is interacting in a social situation.
 (2) where two or more people are interacting from remote locations
 (3) where medical teams are interacting to perform an operation on a patient.

2.1 Disability Induced Social Signal Attrition

Due to the fact that a large portion of human-human interpersonal communication happens through complex non-verbal cueing, individuals who are disabled face myriad levels of difficulty when it comes to interpreting and responding to everyday social interactions. The degree of difficulty depends upon the type and degree of the disability. The difficulty varies based on the kind of disability and the intensity of the disability one faces. Non-verbal cues are mostly interpretative and not instructive as verbal cues (such as speech) are. In a bilateral interpersonal interaction, while speech encodes all the information, non-verbal cues facilitate an elegant means for delivery, interpretation and exchange of the verbal information. People with sensory, perceptive, motor and cognitive disabilities might → with such disabilities often particular lead a healthy personal and professional life. The learning of that they receive facilitated if the This book focuses on the development of visually impaired, including people who are blind. These individuals learn to make accommodations for the lack of a primary information channel and lead a healthy personal and professional life. The path towards learning effective accommodations could be positively effected if social signals could be enriched for the benefit of these individuals. We focus on the topic of building technologies that can mediate interpersonal interactions for people who are disabled and we specifically focus on the issues emanating from the lack of sensory visual channel, like in the case of people who are blind.

~~s such as posture or gestures are~~
~~or visually impaired.~~

2.1.1 Visual Impairment - a hinderance to smooth social interactions

As seen in Figure 1.1, most part of the non-verbal encoding happens through visual media.

While some ~~non~~ ~~part~~ ~~of~~ ~~these~~ ~~cues~~ ~~are~~ ~~perceived~~ ~~visually~~ ~~people~~ ~~is~~ ~~a~~ ~~significant~~ ~~behavioral~~ ~~posture~~ ~~and~~ ~~gesture~~ ~~information~~ ~~that~~ ~~was~~ ~~discussed~~ ~~in~~ ~~Section~~ ~~3.2~~ ~~of~~ ~~Chapter~~ ~~deprives~~ ~~these~~ ~~people~~

This disconnect from the visual stimulations deprive the individuals of vital communicative cues that enrich the experience of social interactions. People who are blind cannot ~~normally~~ ~~and~~ ~~gets~~ independently access this visual information, putting them at a disadvantage in daily social encounters. For example, during a group conversation it is common for a question to be directed to an individual without using his or her name instead, the gaze of the questioner indicates to whom the question is directed. In such situations, people who are blind find it difficult to know when to speak because they cannot determine the direction of the questioner's gaze. Consequently, individuals who are blind might be slow to respond or talk out of turn possibly interrupting the conversation. Discussions with people who are blind and visually impaired has revealed that such social situations can lead to isolation and reduced sense of engagement with the ongoing interactions.

Compounding

To compound these problems, sighted individuals are often unaware of their non-verbal cues and often do not (or cannot) make appropriate adjustments when communicating with people who are blind. Also, people who are blind often do not feel comfortable asking others to interpret non-verbal information during social encounters because they do not want to burden friends and family. The combination of all these factors can lead people who are blind to become socially isolated [71], which is a major concern given the importance of social interactions. While people who are blind and visually impaired face difficulties ~~Ironically, while~~ ~~suggests that~~ ~~in~~ a difficulty in social interactions, research in rehabilitation training for these populations recommends that the social involvement for these individuals have to substantially increase in order to enable their acceptance of the society.

~~To improve~~

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~~Need to increase
their social interaction~~

Recently, Jindal-Snape [72] [73] [74] carried out extensive research in understanding social skill development in the blind and visually impaired children. She has studied individual children (who are blind) from India, where the socio-economic conditions do not provide trained professionals to work with children with disabilities. Her seminal work in understanding social needs of children who are blind have revealed two important aspects of visual impairment that restricts seamless social interactions. These include:

(1) The inability to learn social skills due to the lack of vision
(2) The lack of reinforcement feedback on one's mannerisms

2.1.1.1 Inability to learn social skills due to the lack of vision:

The Jindal-Snape observed that significant others in the environment often fail to give feedback about behaviors that could have an adverse affect on social interactions, and even when they do, it is not meaningful or understandable to an individual who is visually impaired-for example, nodding one's head in reply to a question or gesturing. Lack of meaningful feedback could make it difficult for visually impaired persons to comprehend a conversation [73] [74] and, at times, may stop conversing. Similar studies carried out by Celeste [75] indicated that social intervention by parents and teachers are very important in the formative years of a child with visual impairment. Developing on the work by [76], which emphasizes that short-term feedbacks are never effective, Celeste insists that professionals must identify strategies related to social skills that work, provide consistent support and follow children longitudinally to ensure effective development of social skill set.

People who are sighted do not necessarily have the training to work with individuals who are blind or visually impaired. Thus, unconsciously they tend to neglect people who are blind. For example, sighted people use eye contact as a primary means of keeping attention with people they communicate with. While conversing with a person who is blind or visually impaired, sighted individuals expect the same gaze feedback. The lack of such a feedback may cause eye contact distract the sighted individuals to turn their attention to or assume wandering attention or visually impaired individual. Research indicates that blind individuals with the ability to accommodate social requirements of their sighted counterparts have exhibited immense personal and professional growth.

2.1.1.2 Lack of reinforcement ~~visual~~ feedback on one's mannerisms:

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When individuals display behaviors in any social setting, they receive feedback through their peer's reactions. These reactions could either reinforce or dissuade the behaviors as being appropriate or not, respectively. Due to the lack of visual feedback, people who are blind and visually impaired do not have access to this feedback from their social counterparts. Especially, people who are impaired at a very young age find it very difficult to learn appropriate social actions and mannerisms. Development of asocial stereotypic body mannerisms are one such case where positive reinforcement through visual stimulation is necessary to cull certain developmental behaviors (such as body rocking) that would have been ~~ok~~ ~~are typically extinguished as sighted people grow~~ otherwise weaned off gradually as the child gets into adulthood. ~~toward adulthood.~~

Most persons who are blind or visually impaired eventually make accommodations for the lack of visual information through auxiliary information (mostly audio based cues). ~~Technologies~~ that mediate interpersonal interactions ~~can't be able to assist the user with such compensations, making it easier for~~ children with visual disabilities find it very difficult to learn social skills while growing amongst sighted peers, ~~thus avoiding~~ leading to social isolation and psychological problems [72].

Social disconnect due to visual disability has also been observed at the college level, where students start to learn professional skills and independent living skills. Any assistive technology ~~that can enrich interpersonal social interactions could prove beneficial for visually disabled or blind people during this learning process.~~ persons who are visually disabled. Technology specialist Shinohara [77] [78], observed the everyday activities of a college student ~~who was blind named Sara~~. Shinohara categorized ~~Sara's daily needs into functional categories, and has arrived with 5 important aspects of~~ ~~in Sara's life where she needs assistance. These include (in order of importance)~~ ~~Could benefit from~~

- increased socialization.
- increased independence in doing things.
- increased control over things she does.

- feedback from objects around her.
- increased efficiency in her activities.

As seen from the list, socialization was a very important aspect of this college student's ~~re~~ needs. requirement. Shinohara concludes that design ideas for technology that supports socialization capabilities for people with visual impairment is ~~of absolute necessity~~ absolutely necessary

2.2 Social Signal Attrition during Remote Interpersonal Interactions

The globalization of economies has required that people communicate across geographical distances efficiently and effectively within limited time intervals. This has increased international and intercultural interactions, cultural transactions across various nations where people with different work cultures are coming together to accomplish a common task. Intercultural interactions could cause socio-emotional stress due to differences in work ethics, communication protocols, hierarchy in management? workmanship, etc. Typically such stress is dealt through dyadic face-to-face interactions which is known to reduce cultural stress and communicative misunderstandings. Unfortunately, dyadic interactions are not always possible, and people rely on telecommunication technologies to bridge the separation. Existing technology solutions that are closest to simulating face-to-face interactions (such as telepresence environments) are limited to scheduled, highly structured, and formal interactions. Furthermore, all current telecommunication technologies that support virtual collaborations suffer from emotional impoverishment, caused due to the lack of social situational awareness among participating members of the interaction. In this section, we highlight some of the important problems faced by remote teams when the communication is restricted to virtual telecommunications.

Kock et. al. [80] expands on various studies in the area of professional communication to elaborate on the various problems faced in enriching remote interactions between geographically isolated individuals. In summary, they identify important challenges for e-collaborations, including

Theoretical Challenges!

- Lack of theoretical understanding of media-based human-human communications,

Theoretical Challenges

- Lack of understanding of the human dynamics that make interpersonal interactions so important to humans, Human/User Challenges:
- Lack of technology to provide seamless social presence across geographical boundaries, Technical Challenges:
- Shear complexity of the problem given the above three boundaries, Conceptual Challenges:

Discussions in Chapter 3 will show the correlations between the above four challenges encountered when mediating remote person-to-person interactions, or the challenges encountered when mediating assistive technologies for people who are blind and visually impaired.

Most remote collaboration technologies have historically relied on media richness to compensate for the lack of social presence in media technologies. Early behavioral psychology studies supported this media richness assumption (termed as the Media Richness Theory [81]) that lead to a slew of multimedia technologies that focused on exponentially increasing the audio-visual stimulations (Avatar-based remote communications). However, this approach was not well-received between remote participants. But recent studies, following the epic failure in the acceptability of these media enriched technologies, have shown the need for media naturalness in telecommunication more so than media richness [82]. The naturalness here refers to the sensitivity of the human communicative system to the subtle movements and gestures shown by the face, body and head during social interactions. Robert et. al. [83] address notions that more social presence in media is always better and they theorize that, "the use of media high in social presence induces increased motivation but decreased ability to process information, while the use of media low in social presence induces decreased motivation but increased information processing ability." ?

An industry survey [84] of 1592 individuals who collaborated remotely (carried out by RW3 CultureWizard, a company focused on improving international collaborations) reported difficulties that are representative of the lack of commitment in remote interactions

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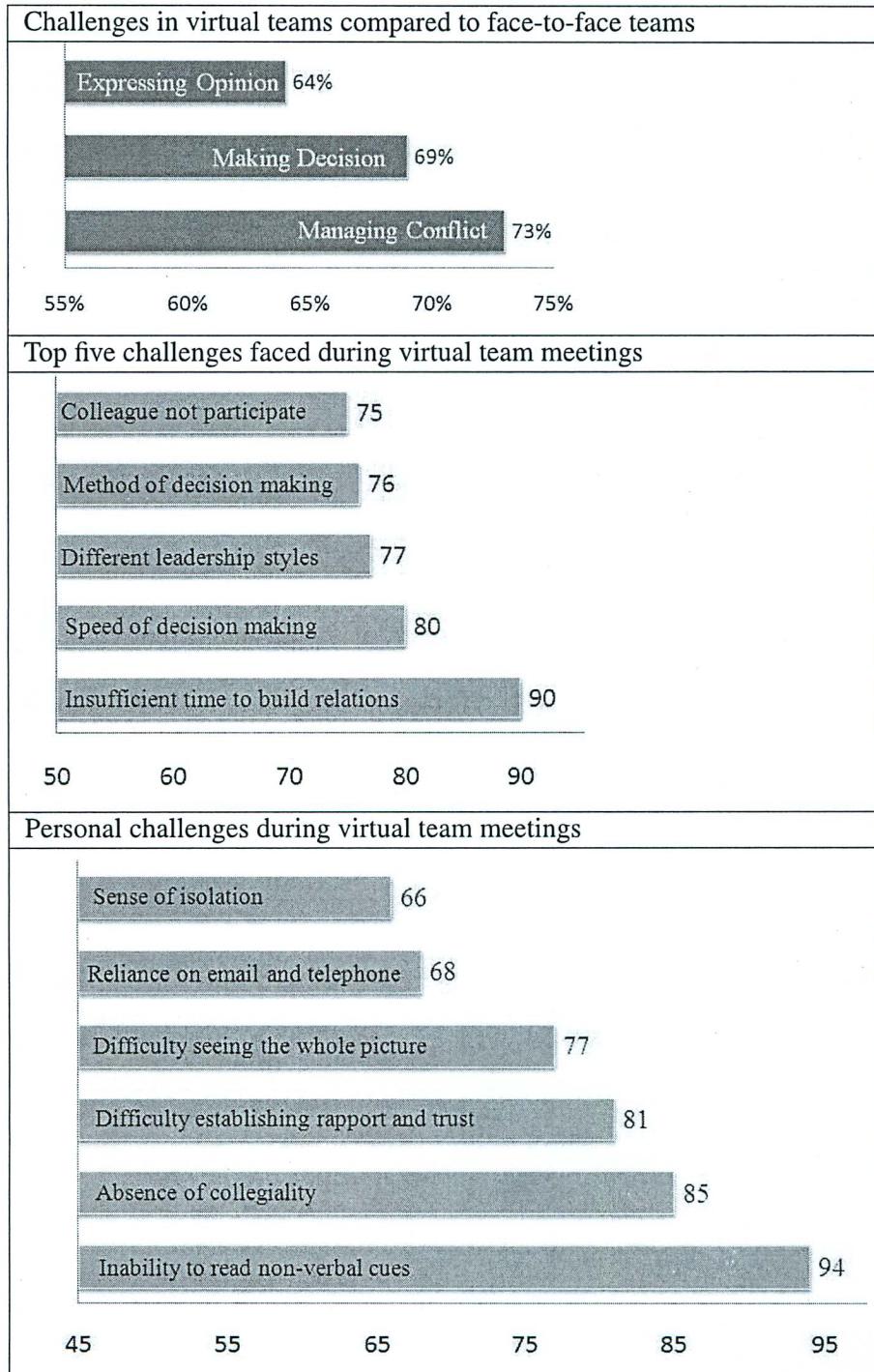
(2) and the inability of virtual teams to correspond and communicate similar to face-to-face team." Respondents found virtual teams more challenging than face-to-face teams in managing conflict (73%), making decisions (69%), and expressing opinions (64%). The top five challenges faced during virtual team meetings were insufficient time to build relationships (90%), speed of decision making (80%), different leadership styles (77%), method of decision making (76%), and colleagues who do not participate (75%)." These results can be correlated to the need for Social Situational Awareness in group settings. In the classical model for group dynamics, Bruce Tuckman [85], defines four stages in the formation of an efficient group. Forming, Storming, Norming and Performing describe the typical process that the groups go through before delivering at their best. The stages of Storming and Norming are deeply connected to the individual group member's abilities to communicate, coordinate and emphasize with their fellow group members. The socio-emotional interactions between the group members dictate how quickly (or slowly) a group will progress from the formative first stage to the performing fourth stage [86].

Further, when the participants were asked about the personal challenges faced during virtual team meetings, they reported inability to read non-verbal cues (94%), absence of collegiality (85%), difficulty establishing rapport and trust (81%), difficulty seeing the whole picture (77%), reliance on email and telephone (68%), and a sense of isolation (66%)." Delivering non-verbal cues, establishing trust and rapport, and easing isolation are all factors that are important for increasing one's social connection to their interaction partners, be it remote or face-to-face. This result is in accordance with psychology studies carried out on e-collaborations. The review of Media Richness and Social Presence theories by Kock ?? highlights very similar problems as described by CultureWizard studies.

As seen from the discussions above, remote social interactions rely on the social presence and situational awareness of the interacting participants and enriching any of the social cues (sight, hearing or touch) through remote means could greatly improve communication dynamics. As will be discussed in Chapter XXX, various attempts have been made at communicating complex interpersonal interaction signals across physical separation. In

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referenced in the text?

Table 2.1: Survey on the challenges of remote interaction.



the following section, we discuss an interesting social interpersonal communication issue that arises within professional environments (specifically critical care medical teams) and show how social situational awareness is of ~~at most~~ importance.

2.3 Social Signal Attrition in Medical Teams

Modern day critical care facilities require multi-disciplinary medical professionals (doctors, surgeons, nurses, anesthesiologists etc.) to operate on a single patient all at the same time. This imposes a hard and fast requirement on the professionals to work as a team. Unlike typical professional teams who choose their members over thorough deliberation, medical teams assume shape dynamically based on whichever medical professional is available on the hospital floor at the time of emergency. Further, these teams last for a very short duration of time (the duration dictated by the emergency) and new teams will form dynamically per need basis. Studies show that teams that establish well articulated communication between members perform well under the stressful environment. Unfortunately, this is not true of all medical teams and one individual's stress may very well propagate through the team and breakdown mutual communication and support, leading to patient's death.

dissolving after their need has been met, with different teams forming for subsequent emergencies

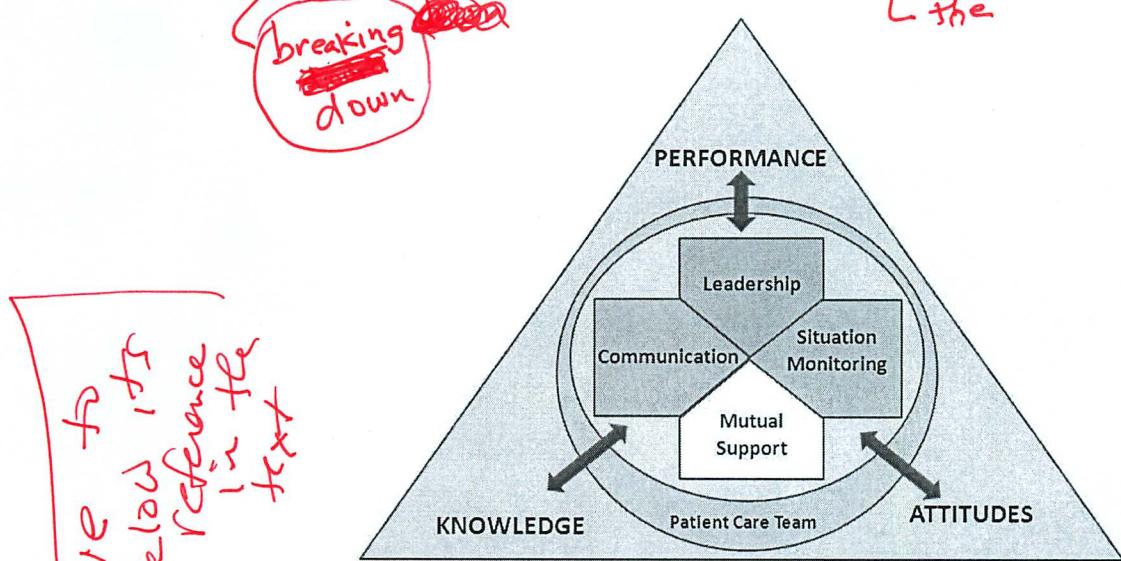


Figure 2.1: TeamSTEPPS: Team Strategies and Tools to Enhance Performance and Patient Safety

The importance of studying a group of physicians entering a medical situation as

a single operating unit began to appear in the focus of behavioral scientists with the publication of the Institute of Medicine (IoM) report titled *To Err is Human: Building a Safer Health System* in Dec 1999. One of the four core messages from the report identified that patient life is lost not because of the failure of an individual, but due to the failure of the team. Since this report, Agency for Healthcare Research and Quality (AHRQ) and Department of Defense (DoD) have focused on team failure from an Evidence-Based Medicine perspective, and released Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) [87] as the standard for team training in health care. The core of TeamSTEPPS, designed to be a training tool that promotes team work among the multi-disciplinary members of a dynamically-formed medical team, focuses on the need to have four important team attributes among the members, namely,

- (a) Leadership
- (b) Mutual support
- (c) Communication
- (d) Situation monitoring (or a shared mental model)

As seen from Figure 2.1, the skills component TeamSTEPPS focuses on the individual physician and the team's ability to work together as a system. Leadership, Communication, Situation Monitoring and Mutual Support were all derived from earlier DoD and AHRQ lead studies in medical team management and are based on the underlying principles of: Team Leadership [88], Mutual Performance Monitoring [89], Backup Behavior [90], Adaptability [91], Team/Collective Orientation [92], Shared Mental Model [87] [91], Mutual Trust [93] and Closed loop Communication [90] (For a detailed analysis of each of these principles, please see King et. al. [94].) Most of these principles are in turn derivatives of the social skill set of the individuals who make up the medical team that is responsible for the patient safety. It has been shown that in cases of medical errors, leading to loss of life, communication breakdown between one or more team members resulted in an avalanche of problems eventually resulting in death.

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Mutual Support

~~Group Dynamics~~

Behavioral psychologists have been studying the impact of socio-emotional states (especially stress induced socio-emotional states) on the performance of professionals and conclude that the direct artifact of stress include deprecated decision making, failure in leadership, and breakdown of mutual support. Further research shows that enriching the social situational awareness of the professionals will reduce directly impact in reducing stress and potentially improve team performance. Further, assessing the socio-emotional and communication skills of the professionals within the critical care unit will provide an unfettered advantage towards determining metrics of team performance under stress. To this end, three parameters have been identified as important towards advancing patient safety in critical care environments: Note that these research questions are still under investigation and their efficacy can only be hypothesized based on preliminary socio-behavioral studies conducted in related areas, under simulated conditions.

Please provide a bulletted list of these 3 parameters here

help predict

2.3.1 Importance factors affecting team performance

2.3.1.1 Group Dynamics

As discussed briefly in Section 1.2.1.2 of Chapter 1 Group Dynamics (GD) focuses on studying the various components of group interactions, including inter-agent communication [95], productivity of a given group [96], level of understanding of each other's potentials and limitations, job satisfaction and combined creativity of a team [97] to name a few. In the recent years, the interest in understanding group dynamics in work environments has tremendously increased in interdisciplinary teams involving computer scientists and socio-behavioral psychologists in the area of Computer Supported Collaborative Work (CSCW) [98]. In the context of medical teams, group dynamics focuses on the ability of physicians and specialists to intercommunicate their needs. During emergency situations, group dynamics facilitates the emergence of a Shared Mental Model [99], which enables all the professionals to relate to each other in terms of what needs to be done towards resuscitating the patient.

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2.3.1.2 Leadership

Theories of leadership have proposed evidence-based models for explaining qualities exemplified in successful leaders. From bureaucratic leaders to political leaders, the models used described to explain the qualities of leaders vary dramatically. There is no single accepted definition of what a leader should represent, as the problem of identifying a leader is highly contextual in nature. Recently, the functional model of leadership has been developed to describe team leaders as having self regulation which translates to learning, performance and adaptability. These models allow studying of dynamic teams that are formed in very short durations (like medical response teams) and allow monitoring of each individual and their contribution to the group activity [100]. Kozlowski et. al. have described a dynamic multi-goal model for team leadership as shown in Figure 2.2. Based on this model, effective leaders as those who can not only assess simultaneously their own goals while keeping track of team goals while approaching a dynamically evolving situation.

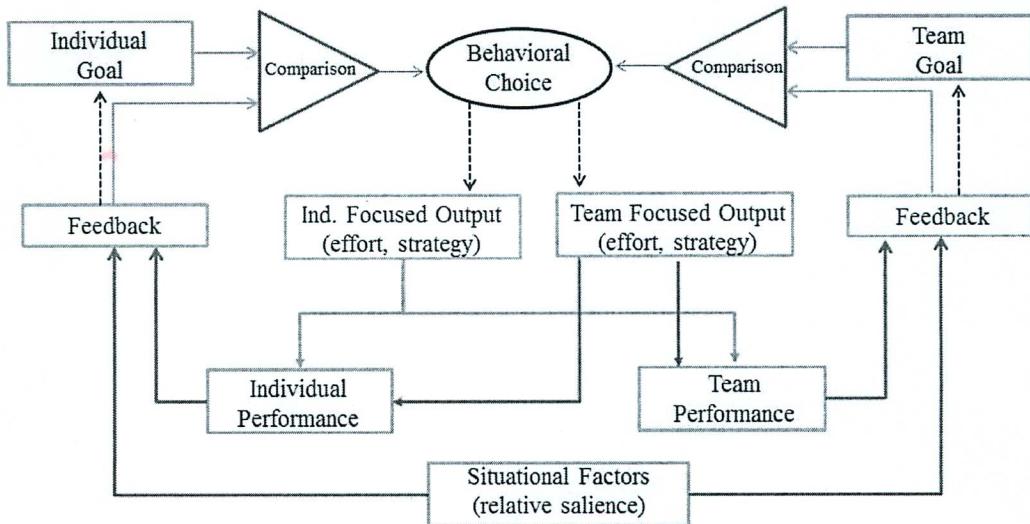


Figure 2.2: Multi goal model of self regulation for effective team regulation.

While Figure 2.2 shows the behavioral choice of the leader to be a vital component of self regulation and team regulation, very little work has been focused on studying the effect of leader's socio-emotional state (assessed through their social situational awareness)

on team dynamics. Recently Sy et. al. [101] have demonstrated how important it is for the leader to control and regulate his/her affect cues within ~~dynamical~~ formed teams. The mood of the leader ~~propagates~~ through the team and can have net positive or negative effect on the ~~team's~~ ^{team's}) on the team outlook and performance. The dynamic nature of team formation is further complicated in medical teams as the responsibility shifts very quickly from one specialist to another as they operate on the patient [102].

2.3.2 Emerging science of medical team social assessment

In light of the issues related to group interactions and leadership, Krishna et. al. [REF] [REF] have suggested studying three important challenges of medical teams through critical care simulation as discussed below. They propose studying interdisciplinary medical residents while they undergo simulations of critical care scenarios. Teams before and after TeamSTEPPS training will be assessed for their leadership, mutual support, communication and situation monitoring. Below, the simulation facility and the proposed research directions are discussed in detail, highlighting the importance of social situational awareness among the medical team members.

2.3.2.1 The Mayo Clinic Multidisciplinary Simulation Center:

Mayo Clinic has invested in the development of state-of-the-art Multidisciplinary Simulation Center, providing many advantages in learning team performance and hospital emergency code training. The center was designed to reflect the complexity of the live clinical environment. The physical, electronic, microcultural and macrocultural environments have been replicated in order to create a practice field for clinical situations. The physical environment was replicated including artifacts such as the bed, sink, cabinets, flooring, doors and lights. The electronic environment replicated with monitors, intravenous pumps, electronic medical records, pharmaceutical dispensing system, decision support software and computers. Promoting interprofessional team training facilitated replication of the micro-cultural environment and imbedding the simulation center within the hospital facilitated the macroculture environment. The patient clinical situations were replicated by combinations

provided by the interprofessional team, and the macrocultural environment was provided by

of high fidelity simulators, virtual reality simulators, standardized patient actors, and low fidelity simulators. Experts ^{have} developed standardized simulation scenarios, curriculum and debriefing specific to learner or team performance level.

Within this environment, a high resolution audio and video capture system was ~~has been~~ unobtrusively placed for performance monitoring and archiving. Data is saved to an internet based learning management system, with individual and team portfolios permitting immediate local or asynchronous remote review and feedback. Teams practice rare or life threatening event management in an error-forgiving environment, gaining experiences which ~~has~~ have been shown to improve patient safety [103]. Some of the highlights of simulated team training include,

- Hospital based center with clinical microsystems reflecting the live environment
- High fidelity simulators, virtual reality trainers, simulated electronic medical record ~~s~~
- Wireless biometric monitoring ~~and~~ ^{an} audio-video architecture ~~for~~ supporting multiple simulation suites, in situ, and in vivo performance archives ^{and}
- Internet based learning management system with individual and interprofessional team portfolios
- Expert developed standardized curriculum and debriefing ^A customizable to the
- Curriculum customized to learner or team performance level
- Error-forgiving clinical experience, enhancing patient safety ^A
- Deliberate practice with supervised instruction in life-threatening events management
- Experience with uncommon scenarios
- Leadership training and debriefing using "Crisis Resource Management" principles

2.3.2.2 Challenges in Social Situational Assessment and Training

The development of automated techniques for

Challenge 1: Automated monitoring of group dynamics to determine communication breakdowns, detect and evaluate

Current team performance analysis systems are mostly based on retrospective video stream analysis collected during simulations of hospital emergency codes. The analyses are mostly based on *expert opinions* of what happened during *the critical incidents* of the simulation [104] [105].

Unfortunately, expert's time is very valuable and post-simulation *analyses* may not get sufficient attention due to *heavy hospital load*. For *long*, researchers have questioned how communication between medical team members vary over the period of the emergency code execution [106], but very little is understood on the basics of the communication patterns during emergency, mostly due to the lack of automated annotation system that *do not require expensive specialist time*. Automated team performance analysis systems that focus on detecting specific instances of communication breakdown occurring *Emergency simulations* during *code simulation* could greatly enhance our understanding of team work and how it can be enhanced through training.

The development of techniques for

Challenge 2: Automatic evaluation of the social affinity between team members: Sociograms

(social affinity maps) have been used historically to determine the interpersonal match between members of a team, or an organization.

Sociograms are obtained through the process of sociometry [107], which quantitatively measures the relationships of individuals who exist within a social space.

As mentioned earlier, in medical teams, the social space happens to be the emergency room where the team assembles with very little (or no) time to assess who are the members of the team.

Sociometry is achieved through a set of evaluations that can assess the social interactions between individuals. The measurements could happen within the environment where the individuals interact (the medical team) or outside (casual interactions).

Technologies developed to assess sociometric affinity between professionals could in turn provide quantitative evaluations of the social interactions between individuals.

Sociograms developed at a hospital level could offer effective tools for quick team formations. Teams formed out of specialists, technicians and nurses who are closer to one another

on the sociogram could offer a team with relatively less emotional stress. Socially closer individuals ~~will~~ also exhibit better communication, thereby increasing team performance.

Challenge 3: Leadership evaluation and nomination through long term monitoring of individuals: Theories of leadership have proposed evidence-based models for explaining qualities exemplified in successful leaders. Recently, the functional model of leadership [108] has been developed to describe team leaders as having self regulation which translates to learning, performance and adaptability. These models allow ~~studying~~ ^{the study} of dynamic teams that are formed in very short durations (like medical response teams) and allow monitoring of each individual and their contribution to the group activity. Reference [108] also describes a dynamic multi-goal model for team leadership which models effective leaders as those who can ~~not only~~ assess their own goals but also keep track of team goals, ^{while} ~~approaching~~ ^{Keepin} in ~~a~~ a dynamically evolving situation. Technologies developed towards ~~understanding~~ understanding and modeling human interactions and communications can provide the tools needed to measure leadership qualities through long-term monitoring.

^{Summary,}
In ~~essence~~, social situational awareness is an important aspect for medical professionals entering into dynamic team settings requiring effective communication between ~~agents~~ ^{team members}. Enriching the awareness of one or more of its members will directly reflect on their performance as a team and hence the patient safety.

2.4 *The* Research Focus of this Book

From the above sections, it is evident that enriching social situational awareness is an essential component of enriching interpersonal interactions for both personal and professional lives of individuals. Further, as can be seen from the three distinct discussions on the need for social interpersonal communication, there is no ^{single} underlying theory of social interactions and social situational awareness that can be immediately leveraged towards developing models of enrichment. Years of research into human-human behavioral dynamics ~~models~~ ^{that are only grounded in} have ~~only~~ resulted in theories ~~that hold grounds on~~ coarse human communication experiments. It has proven very difficult to finely define the nuances of human interactions,

especially under changing contexts. Modeling the complex nature of human interpersonal communications under all contexts of interaction is a grand challenge. Kock et. al. [109] offer this opinion through an evolutionary model for human electronic communications where they argue that humans evolve continuously within their cultural contexts and no one theory can describe the inner workings completely. Kock in his seminal discussion "The Ape that Used Email: Understanding E-communication Behavior through Evolution Theory" [110] argues that a) Media Naturalness, b) Innate Schema Similarity and, c) Learned Schema Variety, as the foundations for human communication. Where, media naturalness refers to the expression of subtleties through technology during human remote communication, innate schema similarity highlights that humans coming from a common cultural context express certain level of similarity in their communication patterns, while learned schema variety refers to the individual differences that makes each person learn as they coexist within a culture. It is this similarity versus variety that makes each person a citizen of the culture, yet an individual on their own.

Acknowledging this complexity, the research highlighted in this book assumes an Evidence-based modeling approach to enriching human-human interpersonal interactions through multimedia mediation. As the name suggests, Evidence-based modeling ~~resorts~~ is based on observations of typical attributes of the problem at hand and proposes to address those problems specifically to the observed context, with little or no generalizations beyond the boundaries of the context. Evidence-based models are common in medical practices where the outcomes of prescribed health care are not considered to be certain observed trends in human health are considered unpredictable due to human (patient) factors, and can never be proven rigorously through the scientific process. A popular remark on Evidence-based Medicine (EBM) or Evidence-based Practice (EBP) reads,

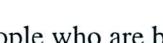
EBM/EBP recognizes that many aspects of health care depend on individual factors such as quality-of-life and value-of-life judgments, which are only partially subject to scientific methods.

Though it has pitfalls, Evidence-based Medicine has been successful in saving lives [111] and increased the perceived quality of life.

Based on the above observations, the research described in the rest of the book follows an evidence-based method towards enriching interpersonal interactions among individuals. Further, the book focuses on the first area introduced in this chapter, mediating interpersonal interactions for people who are blind and visually impaired.

: An example 2.4.1 Example of an Evidence-based Understanding of Social Situational Awareness

The Handshake Example

In Section 1.1 of Chapter 2, the hand shake scenario was introduced as a perspective into the complexity involved with even simple social interactions. Here we reintroduce the handshake and discuss complexity and describe how people who are blind and visually impaired face challenges.         

What seems to be a simple act of shaking hands between two individuals is actually a rather complex cognition of sensorimotor events. Two individuals who engage in shaking hands have to first make eye contact, exchange emotional desire to interact (this usually happens through face and body gestures, such as smile and increased upper body movements), determine the exact distance between themselves, move appropriately towards each other maintaining interpersonal distance that are befitting of their cultural setting, engage in shaking hands, and finally, move apart assuming a conversational distance which is invariably wider than the hand shake distance. Verbal exchanges may occur before, during or after the hand shake itself. This example shows the need for sensory (visual senses of face and bodily actions, auditory verbal exchange etc.), perceptual (understanding expressions, and social distance between individuals etc.), and cognitive (recognizing the desire to interact, and engaging in verbal communication etc.) exchange during everyday social interactions.

People who are blind and visually impaired face numerous challenges when it comes to interactions like hand shake. They are not able to process the visual cues of where someone is standing with respect to themselves (especially in a group setting), they cannot determine if anyone has made an eye contact (indicating a desire to interact) and they are may not be able to determine how far their interaction partners are located and in what direction.

Alternately, they mostly initiate a handshake by standing at one place and extending their

 typically

 As a result,

arm in a handshake posture in the direction where they hear most people conversing, hoping to draw the attention of their sighted counterparts. In dyadic interactions, this situation is ~~sight~~ strategy is likely to elicit a handshake. However, apt towards getting the attention of the interaction partner. Unfortunately, when there is a group of individuals who are all interacting among themselves, it may happen that the individual who is blind will not have sufficient information to determine if any of the sighted counterparts has noticed his/her intent to make social contact.

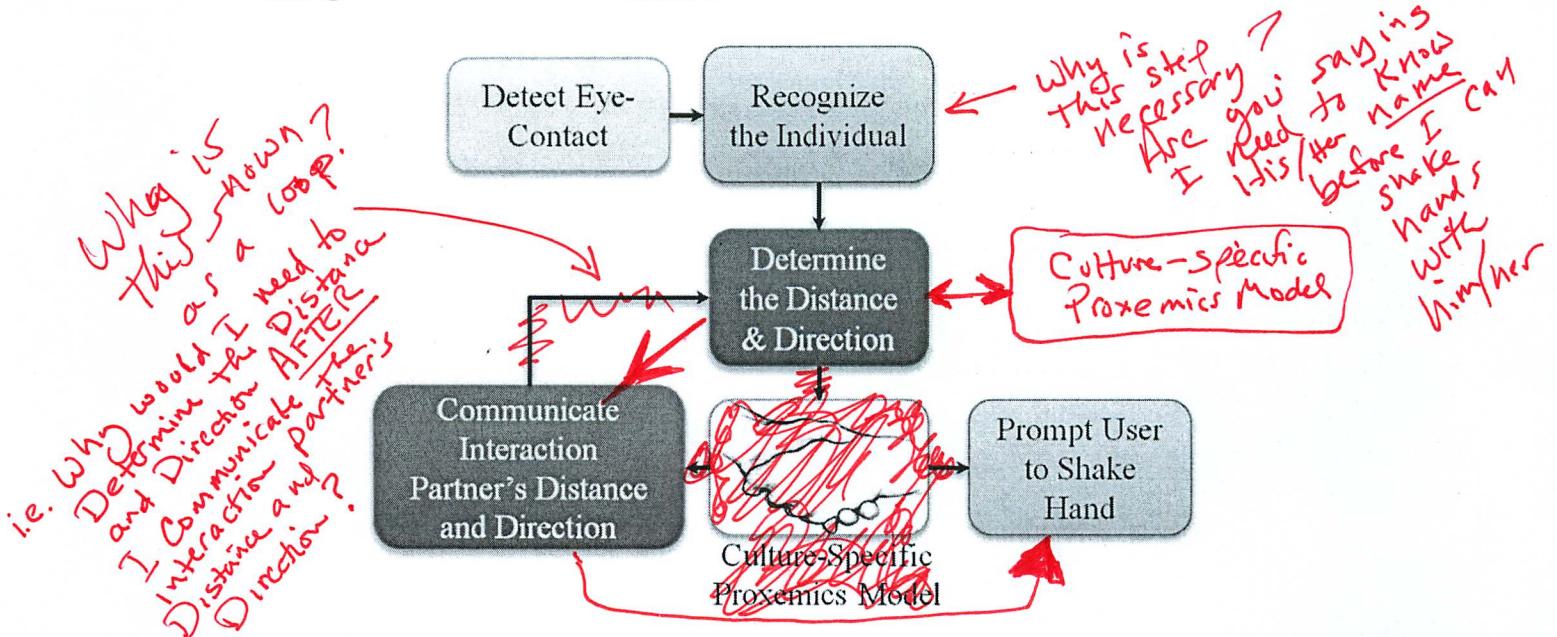


Figure 2.3: Evidence-based Model for Social Situation Awareness to promote handshake non-verbal cueing in the visually impaired and blind population.

Figure 2.3 represents an evidence-based model of delivering social situational awareness to an individual who is blind such that he/she can carry out a handshake social interaction amidst a group of sighted individuals. Note that the Proxemics Model presented in the figure refers to the interpersonal spaces that people occupy on a day-to-day basis, and it is heavily influenced by the culture ~~where~~ in which one resides [112]. We plan to study such evidence-based models for developing assistive technologies that can communicate important non-verbal cues. Chapter 3 discusses in detail how this evidence-based understanding of social situations for people who are blind and visually impaired were extracted towards developing mediating technologies.