

Catch Me If You Can: Technological Constraints/Affordances and Mindfulness during Collaborative Police Emergency Response

Matthijs J. Verhulst
Tilburg University
m.j.verhulst@tilburguniversity.edu

Anne-Françoise Rutkowski
Tilburg University
a.rutkowski@tilburguniversity.edu

Abstract

Nowadays, mobile technology plays an essential role during police emergency response duties. This article presents the result of an ethnographic research in progress. Police officers were shadowed during their shifts (70 hours of observation) in cases of time-pressured incidents. We analyze the entanglement between the material and human agencies while the police officers were responding to two incidents (a holdup and a burglary). We assess the effect of technological constraints and affordances on human mindfulness. Mindfulness is important to achieve a successful collaborative response to an emergency where multiple High Reliability Teams are involved. When technology is not used to its full potential, our results show that it hinders collaboration between teams. Additionally, the results show the amount of time pressure affects the level of mindfulness among police officers.

1. Introduction

Collaborative technology takes on an important role in today's organizations. Research has demonstrated that organizations may achieve significant business improvement streamlining their collaborative work practice [34]. De Vreede et al., state that especially "The widespread availability of smart phones has given whole societies opportunities to participate in large-scale sensemaking, problem solving, and efforts to organize collaborative action" [33:1]. Nowadays, police work and technology are highly interwoven to efficiently support law enforcement duties [17,30]. Mobile technology has become part of the police work routines. Agraval, Rao and Sanders [1] report that the introduction of Mobile Data Terminals (MDTs) in police vehicles has enhanced decision-making allowing police officers to communicate directly with license plate databases. Moreover, the quality and timeliness of information shared through MDTs played an important role in its acceptance [7]. Additionally, police officers reported gain in performance at the individual and

collective level while using their BlackBerry [31]. Pica, and Sørensen [25] highlight the importance of taking the specificity of the police context into account to understand the role of technology. For example, traffic officers and emergency response vehicles use technology differently in their daily tasks and work routines. [30]. The introduction of mobile technology has changed the rhythm of police work without modifying its hierarchical organizational infrastructure [30].

This article presents the result of an ethnographic research (in progress) conducted at the Dutch National Police in the framework of the MEOS program. The MEOS program ("Mobile and Effective On the Street") provides a wide range of mobile technological features to the officers that were previously available only at the station. The goal of the program is to foster collaboration in order to increase efficiency of the officers' work routines on the street. During the 70 hours of observation, we specifically studied the constraints and affordances relating to smartphones usage, and therefore the way these are reshaping police work, enabling collaboration. In the analysis, in order to answer this research question, we assess how multiple the High Reliability Teams (HRTs) composed of two police officers responded to a holdup and a home burglary. We selected these two incidents as they require high level of collaboration within the police force, and also are representative of the time pressure police force have to cope with.

The police organizational infrastructure involves "high reliability", requiring mindful reactions from the organization to the unexpected, i.e., situations with high levels of uncertainty [17]. High Reliability Organizations (HROs) are defined as "organizations that operate hazardous technologies in a nearly error-free manner under trying conditions rife with complexity, interdependence, and time pressure" [32:2]. The literature reports actions to manage the unexpected in HROs. Back-up systems and cross checking for key decision (i.e. redundancy), feedback of people with expertise as well as clear hierarchical structure (i.e.,

deference to expertise) and well-defined procedures are key factors (for a complete description see [36]).

Mindfulness allows to manage and discover unexpected events increasing reliability of the organization [36]. Butler and Gray defined mindfulness as “a focus on the present, attention to operational detail, willingness to consider alternative perspectives, and an interest in investigating and understanding failures.” [6:212].

In the context of HROs, technology can be seen as a “controllable option”, as long as it is treated mindfully [35]. Indeed, research has also demonstrated that the introduction of new technologies is not trivial and impacts organizational work routines as well as collaboration in HROs [29]. We used Pentland and Rueter’s definition of organizational routines as “sequential complex patterns of social action” [24:484]. Such complex patterns of social actions involved de facto the entanglement of both human and material agencies. Therefore, it is not surprising to find theoretical seeds of sociomateriality in the HRO literature under labels such as socio-technological systems [5,10].

Research in the field of Management Information System (MIS) has addressed the role of sociomateriality and organizational routines. For example, Pentland, Feldman, Becker and Liu [23] found that for some routines automation surprisingly results in more variety, illustrating the value of a sociomaterial perspective in assessing human and nonhumans in their entanglement. Leonardi [13] argues that the interplay between material and human agency develops over multiple iterations; and that the perception of technology constraining behavior leads to humans changing the technology. If the technology results in humans perceiving affordance, users are likely to change their routines [13]. Technology Affordance and Constraints Theory (TACT) informs us that while technological features maybe designed to support collaboration, the entanglement between the human agency (e.g., users) and the material agency (e.g., technology) may not enact, for instance, knowledge sharing.

In the context of emergency response of firefighting brigades, smartphone applications embedding collaborative features have been successful in supplying role-specific information independent of time and place, and afforded collaboration [28]. In this article, we propose studying the affordance and constraint of collaborative emergency response in the context of police law enforcement HRTs. We define HRTs as “any set of two or more team members who consistently and effectively work interdependently towards a shared goal in a complex environment” [37:304]. We aim at answering the research question whether the implementation of mobile technology for police officers

affords or constraints collaboration as a function of the level of mindfulness in handling both material and human agencies. The goal of this paper is to address in detail to affordances and constraints as relational concepts, focusing on mindfulness to afford or hinder (i.e., enact) collaborative police emergency response during work routines of police officers.

The paper is structured as follows: first, we explore the literature on technology affordance and constraint in relation to sociomateriality and articulate the concept of mindfulness in relation to human and material agency as presented in the HRO literature. Second, we provide detailed information regarding the research method, context, data collection, human and material agencies. Third, we present the analysis of two incidents and assess the collaborative emergency response in term of affordance and constraints. We conclude with a discussion of the results and their theoretical and practical implications.

2. Theoretical Framework

Rochlin [27] stated that “what distinguishes reliability-enhancing organizations, is not their absolute error or accident rate, but their effective management of innately risky technologies through organizational control of both hazard and probability” [27:17]. Burns and Dietz [5:208] addressing socio-technical systems proposed an emphasis on human agency, later returning to the explicitly structural and system-level normal accident model to analyze errors in HROs. Hollnagel [10], already, proposed thinking about the operators (i.e., users) and the machines they operate as integrated actors when affording or constraining safety. The literature in the field of HRO has been extensively focusing on understanding material agency, human agency and its interplay when affording or hindering safety [5,10].

In the field of MIS scholars have addressed to affordances and constraints as relational concepts [11,13,21]. They propose focusing on the interactions between material agency (i.e., technology) and human agency (i.e., people) rather than on technological features or human attributes separately to afford or hinder (i.e., enact) for example “information sharing”. According to Majchrzak and Markus [16] affordances and constraints emerge when users engage with technology. Affordance refers to an “action potential”, that is, what a user can do with a technology for a particular purpose. Constraints address the way technology may be holding back the users or an organization. Affordances by definition are sociomaterial as they emerge from the entanglement between social and material in practice [14, 23].

From the sociomateriality approach, we learn that that material agency and human agency are entangled

[20]. Neither material performativity nor human agency is favored above the other [15]. In this article we define material agency as the “agency expressed by nonhuman entities” [11:920]. Human agency is defined as the capacity for human beings to make decisions [2]. Leonardi stated “that people’s work is not determined by the technologies they employ” [13:148]. When humans experience constraints from technology, they may change it. Whereas a feeling of affordance triggers human to change their routines [13].

The ontological status of technology is a controversy in the TACT literature [16]. Technology is either perceived as “technology-in-use” that is inseparable from the ways in which people or organizations use it (i.e., no ontological existence apart from its use). Alternatively, technology is seen as “imbricated”, having features and functionalities regardless of whether humans recognize or use them (i.e., ontological distinction between technology and individual or social practices). Independently from the ontological perspective TACT scholars agree on the fact that having a relational concept of technology affordances and constraints distinct from features and purpose, facilitate the organizational understanding of the potential of a technology as well as it sometimes unintended use (for more details see [16]).

Butler and Gray [6] conducted a detailed study on the impact of the introduction of technologies in HROs. They concluded that technology may lead to tasks being executed mindlessly, jeopardizing reliability [6]. Therefore, they propose two ways to achieve organizational reliability in combination with technology: through individual and collective mindfulness, and based on routines. Technology is a mixed blessing in achieving reliability. On one hand, technology may improve the structure of the organizational routines, increasing predictable outcomes. On the other hand, routineness of tasks poses a risk for mindfulness. Automation of tasks may affect state of readiness in reacting to the unexpected.

The concept of mindfulness is key in the HRO literature. As previously stated, Butler and Gray defined mindfulness as four major elements: a focus on the present (i), attention to operational detail (ii), willingness to consider alternative perspectives (iii), and an interest in investigating and understanding failures (iv) [6]. In order to achieve mindfulness, sensitivity to operations, commitment to resilience, deference to expertise, preoccupation with failure, and a reluctance to simplify are required [36:9–15].

The literature in the field of HRO and TACT is particularly informative when studying the impact of mobile technology on collaborative police work routine in emergency response.

3. Method

Ethnographic research bridges the gap between scholarship and practice generating useful knowledge to both parties [9]. This approach is well adapted to our research context. It allows studying, in immersion, collaborative emergency response in practice, disentangling the material (i.e., mobile technology and information system) from the human (i.e., police officers) agencies [18].

3.1. Research context

The Dutch national police is responsible for most law enforcement duties. The Dutch law also outlines the hierarchical structure of the police organization [39]. In practice, the goal of this mandate translates into five core tasks: taking care of security for everyone in the Netherlands, prevent and control of crimes, as well as ensuring public order and tracking down punishable offenses [19]. In 2011, the “Attack Program Information Provision” (APIP), drastically improved the information technology and information structure of the Dutch Police. The three main goals of the APIP program are to improve the technology usage by officers during their daily work routines, the centralization of the information into system and therefore the overall improvement of the technological infrastructure [20].

As a part of the APIP, the organization introduced the MEOS (“Mobile and Effective On the Street”) program in 2013. Its aim is to increase the efficiency of the officers’ work routine on the street. The MEOS program enables officers to complete their fundamental activities independently of their location. This program provides a wide range of technological features that were previously only available at the station, to increase the performance of the officers on the street. The organization is currently implementing a new set of technologies combining a smartphone with a range of collaborative applications to share, retrieve and store information in the police systems. The applications enable officers to retrieve information about vehicles, citizens, previous incidents and criminal records. Furthermore, the smartphones allow officers to record information, for example in the form of pictures or notes. In the near future, officers will be able to scan the identity card of a violator, and automatically transfer this information to another screen to process a fine [12]. The MEOS smartphones offer a range of applications within a secured ecosystem on the device. For example, it is possible to scan the license plate of a car using the camera, and receive almost instant information related to the vehicle. A similar procedure is possible with identity cards or passports. Furthermore, police officers

can use the phone any other smartphone, sending instant messages, taking pictures and recording written notes.

3.2. Data collection

The observer shadowed seven teams of police officers during the entirety of their shifts. The data is composed of two sets of observations (i.e., notes, impression, timeline, officers’ feedback) collected in “real life” fashion along a 70 hours period. The first set of data was collected in July/August 2015, the second in May 2016, at three police stations in The Netherlands. In order to avoid legal implications for the organization, victims, suspects and others parties involved video recording was ruled out. The observer signed a non-disclosure agreement in order to guarantee the privacy of the police officers and citizens involved. The data set was anonymized, analyzed and then shared with the organization. The police officers had full disclosure regarding the purpose of the research.

3.3. Human Agency

The response to an incident follows three consecutive steps: intake, the HRTs’ response, and the administrative work.

Intake: a person calling the nationwide switchboard operator. The operator transfers the call to the police, the fire brigade or the ambulance services. For each region in The Netherlands, there is an Operational Center (OC) in command sending the High Reliability Team (HRT) to an incident. Based on the information reported by the caller, the dispatching officer decides and sends a number of HRTs to the location of the incident with an appropriate level of urgency. In the police force, the HRT is composed of two police officers.

The HRTs’ response: The police officers react and collaborate in answering and solving the situation of emergency. These situations are mostly ranging from catching suspects, resolving physical or violent verbal conflicts, as well as gathering information from witnesses. Depending on the developments during the incident, the number of HRTs may increase or decrease. The dispatcher may call in special units to assist the HRTs when required e.g., police dogs, SWAT teams or police helicopters. A camera operator accompanies the helicopter pilot, the operator has undergone training to use the equipment and look for any suspicious ground activity.

Administrative work: The HRT in charge with the incident later consigned the report of the incident into the P-ERP system when back at the office. The administrative workload depends mostly on the severity

of the incident e.g., stolen or damaged goods, number of people involved in the incident.

3.4. Material Agency

Table 1 presents the technologies used in practice during the 70 hours observation. Technologies are categorized according to their main functionality [38]. We opted for that option as in the framework of our research it was important to first understand the intended goal of the technologies.

Category 1 represents *communication supporting* technology such as the smartphone. Category 2 covers technologies that help *structuring the process* e.g., intake and administration of an incident. The third category supports *information processing* e.g., information provided by the system on the registration of a car [38]. As smartphones offer a range of functionalities, they were classified in categories accordingly. The Basic Information Provisioning Law Enforcement system essentially functions as the Police Enterprise Resource Planning system (P-ERP). The P-ERP system holds information related to incidents, cases and reports. The mobile data terminal displays information about the incident at hand. Later, the department of justice may use the information in P-ERP for the information stored in P-ERP for the prosecution of suspects. The P-ERP has been developed “in-house” is developed throughout the past decade. As most ERPs, it has created its share of complexity. Police officers can access P-ERP with their smartphones as well as through desktop computers.

Table 1, Technologies used in practice during the 70 hours observation by the HRTs categorized according to main functionality (based on [38])

Police Information System	Description	Function(s)
P-ERP: Basic Information Provisioning Law Enforcement	Main ERP system used to collect the administrative data on report	Information processing, process structuring
BVI-IB	Gives access to information from police systems, including P-ERP	Information processing
City-GIS	Geographic information system used by dispatcher to locate vehicles and store information on incident while on the phone with citizen	Communication support, process structuring, information processing

Police Information Technology	Description	Function(s)
Radio-telephone	Voice communication device, each officer carries a radiotelephone	Communication Support
Radio-telephone in vehicle	Voice communication, every vehicle is equipped with radiotelephone. Sending out the status (available, underway, at the scene) to the CityGIS system	Communication Support
Mobile data terminal	Displaying information about incident, present in most police vehicles. Providing turn-by-turn GPS navigation	Process structuring, process information
BlackBerry smartphone	Retrieving information from P-ERP. Receiving and sending text messages and phone calls	Process information
MEOS smartphone	Retrieving and storing information in P-ERP. Receiving and sending text messages and phone calls, Android-based smartphone functions: e.g. WhatsApp, Google Maps	Communication support, process structuring, information processing
(Non-smart)phone	Receiving and sending text messages and phone calls	Communication support
E-mail	Send and receive e-mail messages, sharing files. Accessible through desktop computers and via BlackBerry and MEOS smartphone.	Communication support, information processing

4. Analysis of two incidents

In the next section, we analyze two incidents, a holdup and a home burglary. During these incidents, multiple HRTs of two police officers responded, requiring collaboration. The presence of multiple HRTs

increases complexity for the police officers as it requires more coordination. Additionally, this adds extra time pressure to the already uncertain nature of the incident. We closely assess the entanglement between mindfulness and technological affordances and constraints.

The vignette relating each incident are first presented. Second, the observations and debriefing served as a base to report the timeline of the incidents. It allows distinguishing between the material and human agencies interventions. The timelines presented in Figure 1 and 2 served as a basis to identify each work routines in relation to the events observed during the incidents. Third, these events are presented in tables 2 and 3, respectively for the holdup and the home burglary incidents. We assess the level of mindfulness of the human and material agency based on the HRTs focus on the present (i), attention to operational detail (ii), willingness to consider alternative perspectives (iii), and an interest in investigating and understanding failures (iv) [6].

4.1. Vignette 1: A Holdup

It is 9pm. The end of shift of two officers is in sight. They are making their last rounds in the neighborhoods. So far, the shift has been relatively quiet. The dispatcher sends an emergency radio call requesting their support. A holdup has just taken place at a cafeteria in the city center. The caller reports "three guys wearing masks" entering the cafeteria, possibly armed with knives and guns. In the car, the quiet atmosphere changes quickly. The driver turns the car, and his colleague switches on the lights and sirens. Through the radiotelephone, the fellow officers inform the HRT that the suspects have crossed a small bridge across a canal on a scooter. The officers know that they will not be able to cross that bridge with their police vehicle. After a short but fast drive to the crime scene, the officers split up and ask questions to the witnesses and the owner of the cafeteria. After collecting the testimony, the officers establish the timeline of the holdup. Through the radiotelephone, they follow every action of their colleagues pursuing the suspects. It seems they have abandoned their scooter to flee and are hiding. With the assistance of a police helicopter equipped with thermal cameras, two suspects are located and arrested by the HRT. The officers inform the victim that their colleagues have apprehended the suspects.

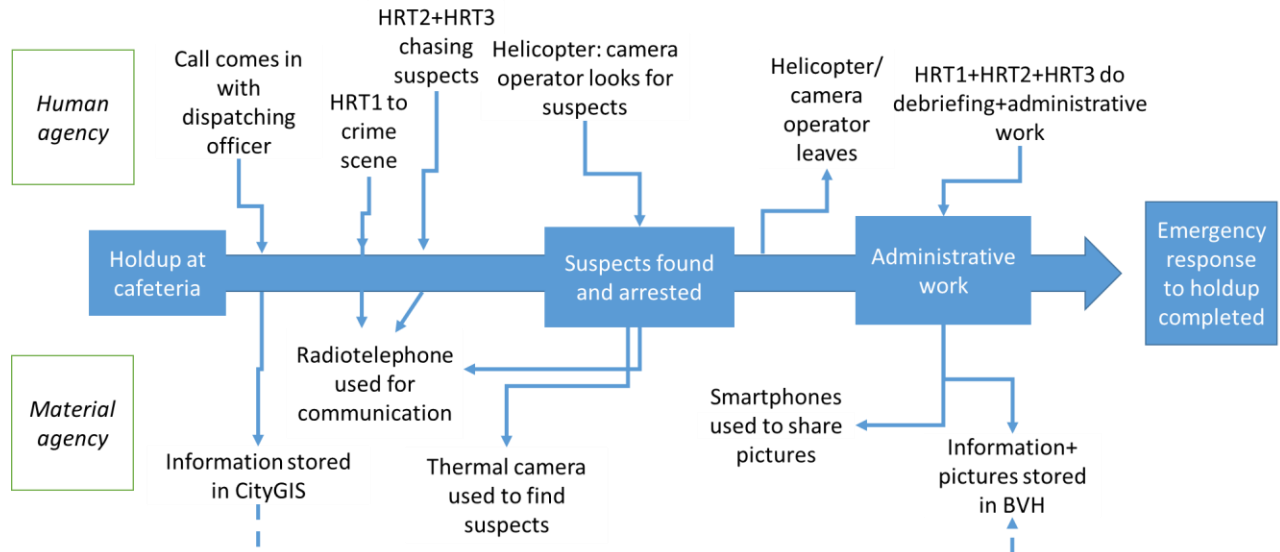


Figure 1, Holdup incident timeline, work routines in relation to the events, material (bottom) and human (top) agencies

Table 2, Holdup incident, work routines in relation to the events, mindfulness assessment for both material and human agencies disentanglement. The different aspects of mindfulness are addressed under the Human Agency: a focus on the present (i), attention to operational detail (ii), willingness to consider alternative perspectives (iii) an interest in investigating and understanding failures (iv)

Events	Technology	Human Agency	Material Agency	Collaborative emergency response
<i>Call comes in with dispatcher.</i>	Telephone, CityGIS	High, dispatcher combines the location of the cafeteria with location and availability of nearby HRTs. He sends 3 HRTs (i, ii, iii)	High, location seen in CityGIS, as well as proximity of HRTs. CityGIS allows anticipating on escape route of suspects regarding multiple bridges and water surrounding the crime scene.	Afford
<i>HRT1 underway to incident location</i>	Telephone	High, officers decide that they should head to the crime scene to collect further information. Driver determines most efficient route to incident location. (i, ii, iii)	High, driver incorporates location of their vehicle in relation to cafeteria, the location of other units, and anticipates on location of suspects	Afford
<i>HRT1 talking with witnesses</i>	Radio-telephone	High, asking questions about details regarding the suspect and relevant for their colleagues; whether the suspects were armed, the language they used (i, ii)	High, communicating descriptions to officers through radiotelephone. Colleagues who have spotted a scooter moving at high speed continuously share information with the complete team.	Afford
<i>Suspects located and arrested</i>	Radio-telephone, thermal camera on helicopter	High, both the officers on the crime scene and the camera operator in the helicopter are ensuring the safety of the officers during the pursuit (i, ii)	High, camera operator scans the area with thermal camera, identifies two areas as suspicious, Operator takes the lead, guides officers on ground through based on images from camera. Communicating through radiotelephone with colleagues on ground.	Afford

<i>Debriefing</i>	MEOS smart-phone	High, officers and dispatcher sit down together, and go through the events of that evening, discussing and explaining timeline with colleagues (ii, iii, iv).	High, officers use smartphones to share information. Additionally, they store pictures in P-ERP as evidence, for example the scooter suspects used to escape or the knife the suspects used.	Afford
<i>Completing administrative work</i>	P-ERP	High, officers have to make sense of what has happened during the incident (ii, iii).	High, the information has to fit the process as designed in P-ERP. The officers file separate reports for the witnesses' statements, the impounding of the suspects' clothes and further evidence in the P-ERP. P-ERP imposes constraints on order and structure, e.g. suspects officers can only enter suspects if they have complete information about them.	Afford and constraint

4.2. Vignette 2: Home Burglary Incident

The dispatching officer listens to a citizen who reports a burglary. Based on the information provided the dispatching officer develops an understanding of the situation: "there is a burglary in progress". The dispatcher broadcasts a report of a burglary in progress via the radiotelephone. Two duos of officers hit the road to the crime scene. The dispatcher connects the data terminal in their car to the incident, directly starting a turn-by-turn GPS navigation. The officers communicate amongst with the dispatcher via radiotelephone. Meanwhile, the mobile display terminal in the car displays the details of the incident.

In the meantime, a third duo of officers has heard of the incident through the radiotelephone and decides to head down to the incident location. Upon arrival at the crime scene, fellow officers are setting up a perimeter around the house. As soon as the officers enter the house, it becomes clear that the burglary is in fact no longer in progress, contrary to what the dispatcher had understood. The house was broken into the night before. Apparently, the victim, who had just returned from her holidays, incorrectly assumed the thieves had just broken into her house when she entered. As there is no longer a chance of catching the suspects, only two officers remain at the scene to complete the reports.

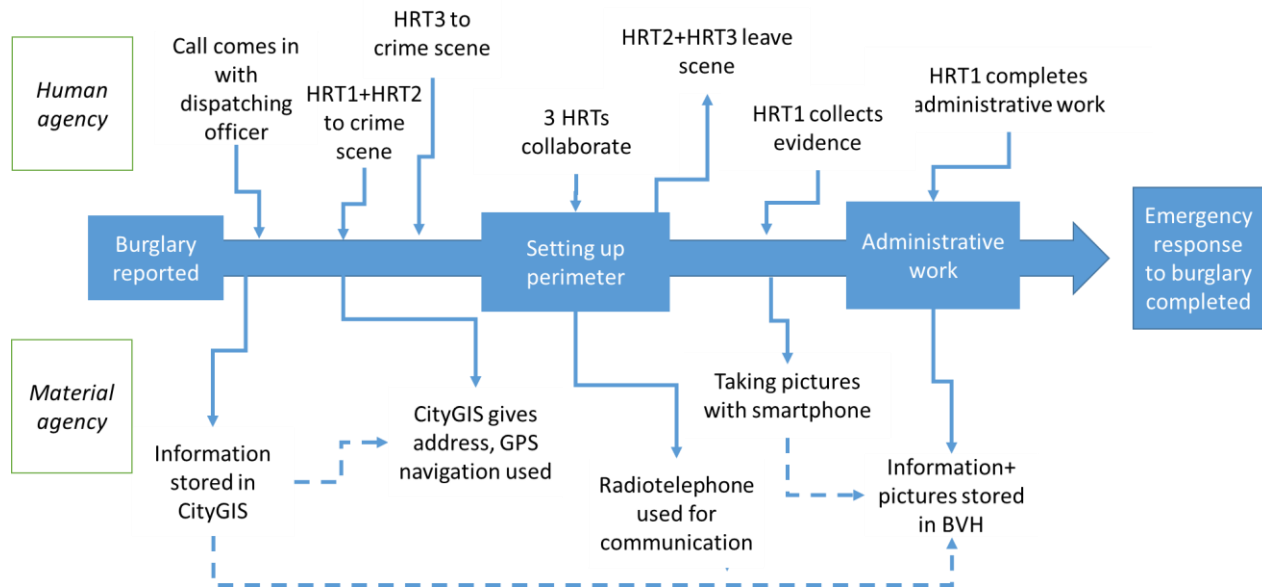


Figure 2, Home Burglary incident timeline, work routines in relation to the events, material (bottom) and human (top) agencies

Table 3, Home burglary incident, work routines in relation to the events, mindfulness assessment for both material and human agencies disentanglement. The different aspects of mindfulness are addressed under the Human Agency: a focus on the present (i), attention to operational detail (ii), willingness to consider alternative perspectives (iii) an interest in investigating and understanding failures (iv)

Events	Tech-nology	Human Agency	Material Agency	Collaborative emergency response
<i>Report comes in with dispatching officer</i>	Phone, CityGIS system	High, dispatcher combines the location of the burglary with location and availability of nearby HRTs. He sends 2 HRTs (i, ii, iii)	High, location seen in CityGIS, as well as proximity of HRTs. CityGIS allows transferring information from CityGIS to vehicle.	Afford
<i>First two HRTS heading to incident location</i>	GPS navigation, CityGIS	Low, following the instructions by the GPS	High, dispatching officer has linked officers to the incident using CityGIS; GPS navigation system provides automatic instructions to the incident location.	Afford
<i>Third HRT heading to incident location</i>	Radio-telephone, CityGIS	Low level of mindfulness involved, as the officers make the decision to go to the scene without reporting to dispatcher.	Low, the technology affords process structuring, but the officers decide not to make use of this functionality of CityGIS not informing back the dispatcher.	Constraint by low human agency mindfulness.
<i>Officers set-up perimeter</i>	Not applicable	High, level of mindfulness Officers make their decisions based on their training, on experiences in the past and their knowledge on the behavior of burglars (i, ii, iii).	Not applicable, no technology is being used for this task	Not applicable
<i>Collecting evidences</i>	Smart-phone, P-ERP	High, the officer to attach the pictures into the case file created in P-ERP, officers have to transfer the image from the unsecured environment on their smartphone to the secured police environment, mindfully developing work around (i, ii, iii)	Low, the officers use their private e-mail account to send the picture from their smartphone to their work address, making it accessible from the secure environment. Then, it can be stored in P-ERP.	Constraint by inappropriate feature of the smartphone, unable to send pictures, afford by high level of mindfulness of officers regarding security
<i>Completing administrative work</i>	P-ERP	Medium level of mindfulness, just about listing stolen goods. Still information has to be structured correctly (i, ii)	Low, the information has to fit the process as designed in P-ERP	Afford and constraint

4.3. Analysis of the two incidents

In this research, we proposed to magnify the material, human agencies and its entanglement in two cases of collaborative emergency responses in the police force. Particularly, we focused on mindfulness. We concluded from our analysis that in the case of the holdup incident, the officers afforded a collaborative emergency response through the entanglement of mindful human agency and high potential material agency. In the first incident, officers expressed high

level of mindfulness throughout the whole process while using technologies (e.g. casting statuses, following radio protocol). They focused on the present, gave attention to operational detail, and were willing to consider alternative perspectives when dealing with technology. They also mindfully collected critical information, which they shared through technology with the HRT engaging the suspects. The officers reported the information into the P-ERP.

From our analysis, we conclude that the level of emergency of the situation may affect the level of

mindfulness of the officers involved. Congruently, the level of mindfulness is entangled with the potential of the material agency has afforded efficient collaborative emergency response.

Interestingly, in the second incident, the home burglary, we could observe that mindfulness led the officers to use the smartphone in a non-deterministic way. They work around the features not to constraint collaboration uploading pictures through their private email accounts into the P-ERP. Surely, it was not the intent of the designer to limit sharing of pictures. The officers found a creative way around the technological features to register additional evidence mindfully in the P-ERP. The MEOS smartphone will be equipped with more functionality in the future. New and interesting entanglements will emerge.

We observed that mindfulness clearly affords collaborative emergency response. However, we found that when officers do not fully exploit the potential of the material agency of technology. This hinders collaboration and may pose a risk for the safety of all parties involved. In the home burglary incident, one HRT decided to head to the incident, while their presence was not required. Furthermore, they failed to report their status into the system to the dispatcher. When asked, the police officers simply indicated that they consciously decided not to cast their status back to the dispatcher. If the presence of this HRT had been required at another location, this would have caused delay and affected the decision making of the dispatcher. Obviously, the police officers decided not using the potential of the material agency, as they were very aware it would have hindered their autonomy. They did not mindfully assess the consequence of this behavior if another incident had occurred, and the “un-collaborative” consequences to the dispatcher.

5. Conclusion and Limitations

The aim of this paper is to address to affordances and constraints as relational concepts focusing on mindfulness to afford or hinder (i.e., enact) collaborative police emergency response. Our findings support the importance of mindfulness in as discussed in the HRO literature [36] in successfully affording collaborative emergency responses. Leonardi [13] had examined the effects of the imbrication between human and material agency on work routines. Likewise, our findings indicate that if police officers perceive technological affordance as constraining during a collaborative response, they may choose to refrain from its use.

In practice, technology has become ubiquitous in the daily organizational life in HROs. The concerns in enacting collaboration through Information

Technologies mindfully is key for organizations going through technological change. This is particularly the case in other sectors such healthcare, mostly within the operating room [26], as well as in sectors involving security and defense [3,8].

From an academic perspective, this study points at the importance of identifying theoretical lenses to better understand constraints and affordances of technologies. Similar discussions amongst scholars address to material and human agency in practice, as well as its entanglement [11,13,21].

This research has it sets of limitations. First, the attempt to disentangle the material from human agencies requires more theoretical support. The theoretical lens we used was a very first attempt at understanding affordance and constraint in HRT when addressing to mindfulness. The different view on ontology provided by TACT scholars surely will help in future research to understand affordance and constraints better. In practice, it was not always possible to observe all the aspects of the response to an incident. This warrants more research, when human collaboration is not required to solve the problem (e.g. during an incident with only vehicular damage), the systems were used efficiently. Less knowledge is then required on the field, this raised new challenges regarding work substitution when task are highly routinized [4]. Although incidents are central in our study, the categorization of situations as incidents compared to situations that are merely an interaction with a citizen is not always clear-cut.

In the future, we aim at involving observers at different locations (e.g., dispatching police officer and responding officers) to complete the overall picture of the incident. This will also reduce the observer bias; although it is highly unlikely that the presence of the observer affected work routines, collecting video recording will support a better understanding. Finally, the organization is in the process of completely replacing the existing BlackBerry smartphone architecture with a new MEOS smartphones offering more functionalities.

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