Sensitive cabbies: Ongoing sense-making within technology structuring

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Abstract

How may users make initial senses around new technology? This question requires an investigation beyond initial sense-making and into ongoing sense-making. An important research agenda is how users may make more senses from ongoing work structuring around technology. The previous studies largely examine how users make initial kinds of sense so as to form certain attitudes towards technology adoption. However, less known to current literature is that users also make ongoing senses as they extensively interact with technology in practice over time. This article presents a qualitative study of the ongoing adoption of CabLink, a Global Positioning System (GPS) which enables vehicle dispatching, implemented by one of the world’s largest taxi fleets, based in Singapore. It analyzes how additional new senses may emerge from a vagary of technology enactments. As a result, users become more sensitive towards adopting technology differentially as they continue to appropriate technology in their work context. This longitudinal research illustrates how local meanings ascribed by different user-groups to a technology may evolve and induce intended as well as unanticipated work transformation. Theoretical and practical implications on ongoing sense-making are discussed.

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Keywords: Ongoing sense-making; Technology enactments; Global Positioning System; CabLink; Qualitative study; Longitudinal research; Work transformation

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“Complex systems make both limited sense and many different kinds of sense. They make limited sense because so little is visible and so much is transient, and they make many different kinds of sense because the dense interactions that occur within them can be modeled in so many different ways. Because new technologies are equivocal, they require ongoing structuring and sense-making if they are to be managed.” (Weick, 1990, p. 2; emphasis added)

1. Introduction

Decades ago, Weick (1990) reminded us that the use of new technologies is more equivocal than we could anticipate. Technology is equivocal because users of all genres could make multiple senses towards the same technology and shape how the technology is exploited (Bijker, Hughes, & Pinch, 1987). Unless we keep track of how senses are evolved around technology, we are unable to manage technology effectively. However, current literature on technology sense-making has yet to fully explore Weick (1990) heedful insights.

Existing literature on technology sense-making is concerned with how technology adoption may be affected by users’ socially-constructed meanings. Sense-making is a social process in which users interpret their environment through interaction with others, construct accounts which allow them to comprehend the world, and respond to events collectively (Weick, Sutcliffe, & Obstfeld, 2005). As users may make ‘many different kinds of sense’ around technologies, their attitudes and actions will inevitably be influenced by these senses in accepting, rejecting, or using a particular technology (Karsten, 1995; Prasad, 1993; Schön & Rein, 1994). By looking into the cognitive processes of the human mind, current research has largely examined how users make new senses of technology at the initial period of technology adoption (e.g. Fulk, 1993; Gopal & Prasad, 2000; Orlikowski & Gash, 1994). Thus far, we know relatively little about the effect of ongoing sense-making occasioned by technology structuring in unexpected ways (Spicer, 2005; Weick, 1990).

Most studies largely examine initial technology sense-making. Overwhelmingly, prior studies analyze how inexperienced users may ascribe different meanings to a novel technology. Less attention has been paid to sense-making that occurs among users adopting technology to their diverse work practices over a period of time, and also before technology is institutionalized into organizations (Edmondson, Bohmer, & Pisano, 2001; Tyre & Orlikowski, 1994). Therefore, one issue worth investigating is: In the transitional period of technology adoption, how may new senses continue to be made as users interact extensively with technology in practice? This research question requires an integration of sense-making and technology structuring literature. Viewed from the technology structuring perspective, a novel technology could enact new work structures in an ongoing fashion, and interactively the use of technology could be re-structured too (Barley, 1986; Orlikowski, 1996). In this way, technology would not only change users’ work structures in the way the implementer expected, but also could enact innovative practices in the most unexpected way (Boudreau & Robey, 2005). A question that requires our attention is: Beyond initial sense-making around technology, how may users make new senses during the process of technology structuring, when users become more sensitive to technology (here ‘sensitive’ does not mean aware, sympathetic or vulnerable; but rather we re-interpret it as having to do with becoming more experienced in figuring things out; Weick, 1988)? Given the equivocal nature of technology, to fully understand sense-making, we need to examine the multiple
The potentials of technology enactments in local practices so as to understand how new senses continue to evolve, in both anticipated and unanticipated ways (cf. Hutchby, 2001; Markus, 1994; Pentland, 1992).

The emergent nature of sense-making within technology structuring is the core of our investigation, which is an issue yet to be fully explored by previous studies (e.g. Gopal & Prasad, 2000; Henfridsson, 2000; Orlikowski & Gash, 1994). The paper is structured as follows. The next section reviews literature on technology sense-making to establish its theoretical basis. Following this, Section 3, explains the method used to collect and analyze qualitative data. Section 4 presents findings by showing sense-making patterns identified over two periods of technology adoption. Situated in the context of Singapore, the case examines how a GPS-based taxi-dispatch system induces innovative practices to work with/around the technology in different ways. The last section discusses the theoretical and practical implications.

2. Literature review

Information systems are equivocal because they are complex, abstract, uncertain, esoteric and recondite (Weick, 1990). They hold multiple meanings for different people, reflecting their hopes, anxieties, dreams and inadequacies (Prasad, 1993). The lens of sense-making helps us analyze how people may attribute meanings to new technologies by examining the symbolic and non-instrumental dimensions of technology adoption (Fulk, 1993; Gopal & Prasad, 2000). This lens examines the social construction of technology, and considers technology as texts which are written in certain ways by their developers, producers and marketers, and have to be read by their users (Bijker et al., 1987). The writer may seek to impose certain meanings on the technology artifact, and to constrain the range of possible interpretations open to users. At the same time, users may also seek to produce readings of the technology-text which best suit the purpose they have in mind for the artifact (Hutchby, 2001, p. 445). By revealing the expressive world of users, we come to understand how technology could be handled within a given social context (Prasad, 1993, p. 1402).

The process of sense-making around technology generally follows three major stages of technology adaptation (Gephart, 2004; Orlikowski, Yates, Okamura, & Fujimoto, 1995; Tyre & Orlikowski, 1994; see the summary in Table 1) namely: (1) sense-making in the initial adoption, i.e. when users begin to make initial senses toward a novel technology; (2) sense-making in the transitional adoption, i.e. when users become more sensitive to the technology as they incorporate it into their practices and become familiar to the technology, and (3) senselessness in the post-adoption stage, i.e. when users make no more sense of technology.

Orlikowski et al. (1995) offered an excellent illustration of this technology adaptation process. First, when users encounter a new technology, they begin to make initial senses toward a novel technology. They then ascribe meanings to the new technology, as well as their own self-image, and the influences of other social forces on their senses (Gopal & Prasad, 2000). Gradually, new technology becomes ‘sensible’ to users. In turn, users establish new meanings, routines, and practices around technology.

Secondly, by experimenting with technology over time during the transitional adoption, users reinforce their practices, and adjust new rules into their work. As they gain a deeper understanding of how to assimilate technology into their work practices, users develop different ongoing senses of technology. In this stage, both the organization and technology
undergo dramatic changes in structure and function (Orlikowski & Robey, 1991). The role of the human agency is active in this stage. Users may enact technology in different ways: they could resist it totally, deploy it minimally, invoke it collectively, or improvise it in unintended ways (Boudreau & Robey, 2005). Through improvisation, new ways of organizing may enact new ways of technology use, which further enact intended and unintended practices (Orlikowski, 1996). Moreover, every engagement with a technology is temporally and contextually provisional. The trajectory of technology enactments is oriented by the interplay of human intentions and technology features, and is further mediated by extensive user-involvement in a diverse range of work practices. In the use of every technology, there is always the possibility of a different structure begin enacted (Orlikowski, 2000). As such, ongoing senses around technology may also be made alongside the process of technology structuring (Gephart, 2004; Weick, 1990).

Thirdly, in the post-adoption period, when technology is fully institutionalized in the organization, users take technology for granted and become ‘senseless’ toward it (Edmondson et al., 2001; Kling & Iacono, 1989; Zuboff, 1988). At this stage, the technical, cognitive and behavioral aspects of technology become stabilized and no more new senses may be made. Technology becomes commonsense to users and unnoticed until episodic change (such as system breakdown) once again triggers new senses (Orlikowski et al., 1995; Tyre & Orlikowski, 1994).

Current literature on technology sense-making largely examines initial sense-making and has fewer opportunities to analyze ongoing sense-making during the transitional

| Table 1 | Sense-making within the technology adaptation process |
|---|---|---|
| **Initial adoption stage** | **Transitional adoption stage** | **Post-adoption stage** |
| Technology adaptation | New technology is introduced into the organization | Technology may be enacted in many ways | Technology is institutionalized into the organization |
| Technology sense-making | Users make initial senses towards technology. Technology becomes sensible to users | Users make more new senses during many potentials of technology enactment. Users become more sensitive to various technology capabilities | Technology becomes commonsense and unnoticed; users become senseless toward technology |
| Outcome of technology use | Users form decisions to adopt or reject technology | Technology enacts intended as well as unanticipated work innovations | Technology is embedded into work routines |
| Related research | The analysis of initial sense-making includes groupware adoption (Henfridsson, 2000; Karsten, 1995; Orlikowski & Gash, 1994), the electronic marketplace (Barrett, 1999), the group-decision support system (Griffith, 1999), technical service work (Pentland, 1995), educational computing (Schön & Rein, 1994, chap. 5), the electronic mail system (Fulk, 1993; Markus, 1994), and information systems for healthcare (Prasad, 1993) | How may more senses be enacted from technology structuring? This is a less examined area (cf. Bansler and Havn, 2004; Henfridsson, 2000; Siino and Hinds, 2004; however, these studies focus more on cognitive analysis rather on the interplay of technology structuring and sense-making) | It is rather difficult to alter established routines and norms (Edmondson et al., 2001; Kling & Iacono, 1989; Orlikowski et al., 1995; Tyre & Orlikowski, 1994; Zuboff, 1988) |
adoption stage. Two inter-related theoretical issues require further investigation: (1) what senses are made, and (2) how senses may affect technology use.

**What different kinds of senses are made.** Initial senses could be triggered by technology features under three conditions (Louis & Sutton, 1991) namely: (1) when the situation of technology use is novel, (2) when there is a discrepancy between what is expected and what is observed in the new technology, and (3) when there are deliberate initiatives, such as when the user is asked to make choices through technology. Under these triggering conditions, users make initial senses of the new technology, generate local interpretations, decide whether to accept or reject the technology, and consider how to appropriate the technology (Orlikowski & Gash, 1994).

When senses are triggered by technology, users begin to make multiple interpretations of technology. Current literature has examined many patterns of initial sense-making in various technologies, such as the adoption of groupware (Henfridsson, 2000; Karsten, 1995; Orlikowski & Gash, 1994), the electronic marketplace (Barrett, 1999), the group-decision support system (Gopal & Prasad, 2000), technical service work (Pentland, 1995), educational computing (Schön & Rein, 1994, Chapter 5), the electronic mail system (Fulk, 1993; Markus, 1994), and information systems for healthcare (Prasad, 1993). A typical example is illustrated by Prasad’s (1993) analysis of computerization in a healthcare maintenance organization, which observes how nurses, clerks and clinical doctors make multiple senses of computers. Three patterns of sense-making were identified: (1) pragmatic symbolism: nurses considered computers as efficient, professional, inevitable, and linked to organizational survival; (2) romantic symbolism: clinical doctors considered computers as intelligent brainpower, loyal partners, and reliable employees; and (3) pessimistic symbolism: clerical staff considered computers as control mechanisms which might lead to physical hazards, organizational turmoil, and social alienation. Prasad (1993) observed that the pragmatic and romantic interpretations outweighed the pessimistic interpretation. Consequently, the first two interpretations created a favorable climate for technology use, ensuring long-term commitment from users. A similar sense-making pattern regarding automated robot adoption in another healthcare administration is also identified by Siino and Hinds (2004).

These patterns offer a rich understanding of initial sense-making around new technology. But, how may users’ senses around technology evolve, when users continue to experiment with technology? The current studies seem to be reticent in answering this question, which gives rise to the issue of human agency. As discussed earlier, users’ sense-making may evolve when they interact with technology in their work practices in the transitional stage (Boudreau & Robey, 2005; Weick, 1990). In this regard, many potentials of technology enactment may surface new senses. Phrasing it differently, when users come to employ technology in new ways, their understanding of the technology could also be changed.

Therefore, we are unable to gain a full picture of technology sense-making, if we do not analyze how senses evolve. For example, Faraj, Kwon, and Watts (2004) found that users’ senses could evolve and reshape the ongoing designs of web browsers. Spicer (2005) offered another case in point by examining electronic commerce adoption in an Australian broadcaster. He discovered that web-based technology had been appropriated differently at four different stages of sense-making: as new media, as a commercial resource, as an information corral, and as a global advertising lever. However, his analysis was based on how different political agendas shape users’ sense-making of e-commerce. Both the studies of Faraj et al. (2004) and Spicer (2005) emphasized solely the cognitive aspects of actors,
and neglected the fact that users’ sense-making is inevitably situated in a diverse range of work. When users’ practices are transformed through multiple technology enactments, they may make new senses around the technology.

Therefore, we need to examine not only the initial sense-making (when new technology is just introduced) but also the ongoing sense-making (when users assimilate technology into their local practices). Although several studies have attempted to examine how senses may be made from technology structuring, they largely analyze users’ perceptions rather than users’ actual work (e.g. Bansler & Havn, 2004; Faraj et al., 2004; Spicer, 2005). As Griffith (1999, p. 485) urged, an area requiring immediate research effort is to consider how users come to make sense of technology in relation to their working knowledge in a given context.

**How sense-making outcomes affect technology use.** By examining different patterns of sense-making, current literature is able to explain why a particular technology is adopted. If the sense-making outcome is positive, productive technology use is anticipated, or otherwise rejected. For example, Orlikowski and Gash (1994) analyzed the early use of a groupware system by targeting two primary user-groups: technologists and users. They identified conflicting sense-making patterns between the two user-groups, leading to misaligned expectations and contradictory actions. Likewise, Schön and Rein (1994) identified conflicting sense-making patterns among policy-makers, technologists, and users in a university setting. On their part, Edmondson et al. (2001) analyzed conflicting sense-making patterns between implementers and users in the adoption of cardiac surgery technology. Eventually, the conflicting sense-making patterns resulted in skepticism, resistance, and spotty adoption.

More often, users’ senses are not so predictable, and technology may be adopted in unintended ways (Barrett, 1999; Henfridsson, 2000; Karsten, 1995). For example, Karsten (1995) found that multiple senses may be made around the same technology which are unanticipated by the implementer. Her study examined groupware adoption in three different organizations. In the first case, groupware was implemented to increase efficiency in job dispatch. However, the tester perceived it as a ‘faster calculator’, while the department head considered it as a ‘soft typewriter’. Eventually, the subject of efficiency was forgotten. In the second case, groupware was adopted to accelerate information delivery. But, the librarian perceived it as a ‘bulletin board’, while the manager worried that personal knowledge might be exploited. The original goal was ultimately deviated. In the third case, groupware was introduced to enhance process quality. But, while the production engineer was fascinated with its collocation features and the secretary praised its documentation systems, no one paid serious attention to quality matters.

Moreover, Henfridsson (2000) examined the adoption of communication systems in Swedish social service departments, which were designed for promoting learning organization. Although the systems were fully utilized, users’ limited senses eventually constrained technology use. While managers perceived the systems as ‘communication boosters’, group leaders perceived them as ‘interaction builders’, and social workers perceived them as ‘collaboration platforms’, few people actually engaged the systems for developing learning organization. By examining multiple sense-making patterns, we are able to understand why technology may be improvised and adopted in the most unexpected ways.

However, thus far we have learnt relatively little about how technology may be blended into users’ everyday work (Boudreau & Robey, 2005). We may ask: How may technology bring about intended and unanticipated innovative practices, so that users come to
understand technology differently? Given that technology is equivocal, it is possible that users could develop different local practices to exploit the full potential of technology, as well as to work around technological surveillance. By understanding such local practices, we may trace the reasons why users make more senses of, and adopt technology, in certain ways.

In summary, to advance the current stage of theoretical development, there is an immediate need to move beyond initial sense-making and explore ongoing sense-making – i.e. to examine how more senses may emerge from multiple potentials of technology enactment (cf. the study of Dutton & Dukerich (1991); in which ongoing sense-making occurred without technology). Our research attempts to fill up this theoretical gap through a field study of the GPS-enabled taxi-dispatch system, known as CabLink, which is based in Singapore. This study traces how cabbies have constructed meanings around CabLink in two time-periods. The findings explain why emergent senses could be made from users’ extensive interaction with technology.

3. Research methods

A qualitative, naturalistic methodology is well suited to our goal of generating theory in a context consisting of users’ ongoing interpretations towards technology use (Lincoln & Guba, 1985). Especially, individuals’ sense-making in technology involves an intricate interaction of people, technology, and work context. In this article, a field study is used for ‘theory elaboration’, drawing on and extending theories from technology sense-making at the user level (Gopal & Prasad, 2000; Henfridsson, 2000; Orlikowski & Gash, 1994). Theory elaboration is often used when pre-existing theories offer a sound foundation for an emergent study and obviate the need for building theories through a purely inductive analysis.

Process analysis is used for analyzing technology sense-making (Pettigrew, 1990). In the tracing of the process, we examined users’ sense-making around technology and their work practices to guide our efforts in data collection and analysis. In so doing, we considered that actors’ sense-making serves as a springboard for actions which enact new practices and are constrained by their work environment (Hutchby, 2001). For our study, ‘practices’ are defined as recognizable patterns of action and improvised activities responding to specific situations in a work context (Orlikowski, 1996, 2000). These practices are developed into ‘local knowledge’ within a community of users, and which even people engaging in them find difficult to fully comprehend.

3.1. Research context

Our fieldwork was based at Comfort-Delgro Transportation (hereafter referred to as Comfort), which is the second largest land transportation group globally and has the largest computer-mediated taxi fleet in the world using CabLink. The S$32 million (circa US$20 million) satellite-based taxi-dispatch system was launched in Singapore in 1996, and managed 11,800 taxis with 25,000 contracted cabbies who are self-employed. CabLink consists of an automated taxi-dispatch facility integrating an Interactive Voice Response (IVR) and the GPS, which together coordinate 350,000 trips for 600,000 commuters daily. Through CabLink, taxi drivers’ booking fares amount to US$62.5 million per year, and the collections from booking fees have peaked to US$20 million per year.
Replacing the earlier radiophone paging system, CabLink offers an optimal transportation resolution. All incoming booking calls are connected directly to Comfort’s dispatch system, which is capable of tracking vehicle location in real-time with great accuracy. Customers can call the dispatch centre or use the automated phone system known as SpeedCall, which is a text-to-voice, computer-mediated booking system implemented in 2003, to make requests for vehicles (see Fig. 1a). In a typical situation, a commuter calls Comfort’s

**a. CabLink-enabled Dispatch Process**

**Process of Taxi Dispatch**

- Calls Received ➔ Calls Answered ➔ Calls Dispatched ➔ Calls Catered

**Modes of Booking**

- Dial-a-Cab (Non Automated) 40%
- Dial-a-Cab (Automated Dispatch) 60%
- Call Centre (dispatched by human agents)
- Call Centre (dispatched by computer systems)
- GPS Network
- Inform and pick up passengers

**b. MDT and In-vehicle Devices**

- MDT (Mobile Data Terminal)
- Emergency Switch
- VHF Radio
- GPS
- Central Processing Unit
- Smart Meter
- Receipt Printer
- ERP (Electronic Road Pricing) Reader
- Covert Microphone
- Map Display
- Credit Card Reader

Fig. 1. CabLink-enabled dispatch process and in-vehicle MDT devices (*Source*: Comfort Transportation).
dispatch centre; and once the operator enters the destination and location of the commuter, CabLink automatically detects the nearest vehicle and sends messages to the Mobile Data Terminal (MDT) which is installed in the taxi (see Fig. 1b). The automated phone system then reads out the latest booking record from the database. If the address in the record matches the caller’s latest pick-up point, the passenger can immediately confirm the booking through the telephone. When the task is confirmed, the system informs the customer of the registration number of the vehicle and the proximal time of arrival. Cabbies also receive the passenger information from the MDT, which can locate vehicles in case of an emergency in real-time.

CabLink offers two main technical functions: automated and manual. In the automated mode, a task will be dispatched to the nearest taxi without negotiation. If no taxi which is in the automated mode is available, the system will detect nearby taxis which are linked to the MDT in the manual mode within a two-kilometer range. The invited cabbies can bid on a particular task using predefined choices of Estimated Arrival Time (EAT), with four arrival-time choices: 5, 7, 10, and 15 min, respectively. On a first-come-first-served basis, the cabbie who submits the shortest EAT will win the bid. In the manual mode, cabbies can choose to reject the call, should they find the task unfeasible. Once the task is assigned, the cabbie cannot reject the task, except in urgent situations. If the cabbie breaks his promise regarding more than two tasks within a single day, their MDT will be shut down for two hours. If he refuses more than four tasks in a day, his MDT will be disconnected for 24 h.

In its business model, CabLink is a compulsory adoption for cabbies. Comfort leases vehicles to ‘hirers’ for a rental fee of approximately US$75 per day. Hirers can decide whether they want to find ‘relief drivers’ to share vehicles with. The cost of CabLink services is included in the vehicle rental fee. In general, a cabbie would need to make at least 7–10 trips daily to cover the rental cost, and the average income varies around US$650–2000 per month. Over an adoption period of eight years, the average incoming booking calls had climbed from 2005 to 30,000 per day of which 60% were through computer systems and 40% were through human agents. CabLink was considered as a highly successful system in terms of accuracy, efficiency, communications, user acceptance, and productivity, by the general public. In the 2003/4 period, Comfort won the Management Information Systems (MIS) Innovation Awards, which are measured by innovation, value to customers and employees, and financial benefits. It subsequently won the Intelligent 20 Award, and was elected as one of Asia’s top 20 companies that are recognized for employing information systems to drive operational excellence.

To Comfort, CabLink provided an important way of ensuring the quality of customer services, reducing maintenance costs, boosting revenue from dispatch surcharges, improving fleet management, and confronting the rising competition, as three new taxi companies were incorporated during the 2004/2005 period. This brought the total number of taxi companies in the market to five, including Comfort/CityCab (CityCab was merged with Comfort), Premier, SMART, Transcab, and SMRT.

3.2. Data collection

We adopted two data collection strategies to increase the authenticity of this naturalistic inquiry (Golden-Biddle & Locke, 1993). First, we had a prolonged engagement at the research site and undertook longitudinal observations to sensitize us to the social context
of the cabbies. The first and third researchers conducted fieldwork spanning a period of more than three years (June 2003 to August 2006). Informants were drawn from three source groups: (1) Comfort’s managers, the engineers of Singapore Technologies Electronics (the technology provider), who helped us understand CabLink’s technological functions, dispatch-centre operations, and company policies; (2) Comfort’s contracted cabbies, consisting of the largest group of our informants; and (3) independent experts such as a hospital doctor who specializes in taxi drivers’ healthcare problems and government officials who were in charge of transportation, who helped us understand the institutional environment in which the taxis operate. As a whole, we conducted open-ended interviews with more than 150 persons on various occasions (see Table 2) which were based on accepted theoretical sampling principles (Glaser & Strauss, 1967; Lee & Baskerville, 2003).

Second, we collected descriptive data through triangulation in data sources and methods. Three sources of data were gathered using different methods. The first was to conduct free-flow personal interviews with cabbies when they were on the job (actual practices). From various locations, we hailed taxis either at different taxi stands, or on the streets, and through CabLink by means of fixed lines or mobile phones. Using ethnographic

Table 2
Sources of data collection

<table>
<thead>
<tr>
<th>Source/method</th>
<th>Number of people interviewed</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formal interviews</strong></td>
<td></td>
<td></td>
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<tr>
<td>Managers (Comfort and Singapore Technology)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Drivers</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td><strong>Informal interviews (during cruising)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabbies who employed Radio-dispatch</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Sailor Cabbies</td>
<td>7</td>
<td>7</td>
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<tr>
<td>Hunter Cabbies</td>
<td>35</td>
<td>38</td>
</tr>
<tr>
<td>Fighter Cabbies</td>
<td>32</td>
<td>45</td>
</tr>
<tr>
<td>Traveler Cabbies</td>
<td>37</td>
<td>39</td>
</tr>
<tr>
<td>Dweller Cabbies</td>
<td>48</td>
<td>48</td>
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<tr>
<td><strong>Non-participant observation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drivers’ community-related activities</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Shadowing of drivers (observation in situ)</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td><strong>Other ways of obtaining data</strong></td>
<td></td>
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<tr>
<td>Mixing with taxi drivers in their canteens on a biweekly basis</td>
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<tr>
<td>Participating in their community activities (approximately five times) on a monthly basis</td>
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<tr>
<td>Conducting onsite audit with drivers in Comfort’s service centers</td>
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<tr>
<td>Observing dispatch centre operations onsite</td>
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<tr>
<td>Interacting with six selected drivers (July–December 2004)</td>
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**Documentaries**

- SARS period travel itinerary: Examining drivers’ daily itineraries
- CabLink technical manual: Studying 60 copies of related technical documents, amounting to 300 pages
- Other sources of documentation: Minutes of Comfort technical meetings
methods, we began our interviews in an informal manner. As we boarded a taxi, we began to chat with the cabbie, introducing ourselves as researchers, and quickly started our interviews en route to our destinations. The cabbies in Singapore use a mix of three languages: English, Mandarin and local dialects. As a general principle, they use English to communicate main ideas, Mandarin to elaborate concepts, and local dialects to talk about personal matters. The first and third researchers are fluent with the three languages and use the different languages in various social situations to collect data, although none of the researchers are Singaporeans. We invited cabbies to describe their daily work routines, to explain why they preferred a particular routine, and to express their views on CabLink within their working context. We asked them to give plenty of examples during the journey, so as to minimize the effect that they were giving us an idealized account of how they made sense of CabLink. During the research period, we took different taxis to different places in order to maximize our understanding of the cabbies’ daily practices and local transportation conditions.

The second data source was the communities and habitual sites of the cabbies. To enhance our understanding of their social contexts, we visited the company headquarters as well as the cabbies’ stopover canteens and specific locations such as the customs check-point next to the Malaysian border, and the food court in Ayer Rajah. Data collection and analysis were conducted concurrently so as to unearth thematic coding for technology sense-making. We mingled with the cabbies at their sites; and when trust had been built, we began questioning them. This data gathering method allowed us to interact with the cabbies without the pressures of time-constraints. The cabbies were exceptionally open and receptive to our questions. With his permission, we participated in a cabby’s family gatherings and church activities to get a feel of his daily interactions, lifestyle and occupational values. Following each observation and interview, we prepared stenographic notes.

The third source came from non-participant observation and archival data. At a later stage, we observed four additional user-groups (see Table 4), and presented our findings to opinion leaders. On their part, these opinion leaders helped us identify cabbies who best characterized each category. We selected four cabbies from each user-type and hired their taxis for half-day onsite observations. These cabbies were aware of our research intentions and drove us through their daily routines. From these onsite observations, we gained deeper insights into their work practices and the way in which they perceived CabLink.

Our understanding of the cabbies’ practices was enhanced by archival data. The computer-generated itineraries helped us verify the routines detailed by the cabbies. Through this long-period observation, we came to learn about cabbies’ local terms. For instance, cabbies often used the local languages to describe their destinations within the communities, that is, they often referred to the city centre as ‘bow-die’ (downtown area), and to technology limitations, such as many street locations (many with localized and hence unofficial names) which cannot be captured accurately by CabLink’s satellite systems.

3.3. Data analysis

Although data analysis generally consisted of four stages, data was examined simultaneously with ongoing data collection following a dialectical rather than linear process (see Table 3). At the first stage of our research, most of the cabbies interviewed were less-experienced users of CabLink. Our purpose was to understand how cabbies made initial senses of CabLink during the initial adoption period. At the second stage, between 2000 and
Table 3
Data analysis and coding scheme

<table>
<thead>
<tr>
<th>Data analysis</th>
<th>Tasks</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
<td>Initial sense-making triggered by CabLink (period: first two years of adoption)</td>
<td>(1) Analyzing how cabbies made sense of CabLink through the three triggering conditions (novelty, discrepancy and deliberate initiative) to understand the motivation of technology use</td>
</tr>
<tr>
<td>Source: Retrospective interviews with senior drivers and senior business executives</td>
<td>(2) Analyzing how CabLink restructured cabbies’ work practices</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Analyzing how new local knowledge was enacted by cabbies</td>
<td></td>
</tr>
<tr>
<td><strong>Stage 2</strong></td>
<td>Technology enactments and ongoing sense-making (period: the third to eighth year of adoption)</td>
<td>(1) Analyzing a variety of users’ driving routines and identifying four types of work innovations</td>
</tr>
<tr>
<td>Sources: Interviews with taxi drivers, onsite observation, and historical data obtained from CabLink</td>
<td>(2) Analyzing cabbies’ capabilities in appropriating CabLink into their work practices, which allowed us to observe the drivers’ local knowledge enacted as a result of using CabLink</td>
<td>Four new senses enacted from ongoing use of CabLink</td>
</tr>
<tr>
<td></td>
<td>(3) Analyzing how different groups of users became more sensitive to the use of CabLink, in different ways</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) Analyzing how users employed CabLink differently</td>
<td></td>
</tr>
<tr>
<td><strong>Stage 3</strong></td>
<td>Refining coding schemes by examining users’ work changes enacted by CabLink, new senses enacted from such work changes, and different modes of technology use</td>
<td>(1) Gathering more of cabbies’ practices to test and enrich the robustness of the coding scheme (i.e. four patterns of technology sense-making)</td>
</tr>
<tr>
<td></td>
<td>(2) In the reiterative process, performing the four coding procedures stated in Stage 2 to enhance the authenticity of the data</td>
<td></td>
</tr>
<tr>
<td><strong>Stage 4</strong></td>
<td>Triangulation and verification</td>
<td>(1) Sending the findings to drivers, technology vendors and business executives of Comfort for further improvement of the coding scheme’s plausibility</td>
</tr>
<tr>
<td></td>
<td>(2) Presenting the findings to three groups of selective passengers for a plausibility test of the findings</td>
<td>Table 4</td>
</tr>
<tr>
<td></td>
<td>(3) Proposing a theoretical framework for understanding ongoing technology sense-making</td>
<td></td>
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</tbody>
</table>

2006, as users had become more familiar with CabLink, we traced how they appropriated CabLink differentially to enact new work practices. Consequently, we identified four patterns of new work practices emerging from distinctive user-groups. These new practices helped us understand how cabbies became more ‘sensitive’ to the capability and constraints of CabLink. At the third stage, we refined the categorization of sense-making by interview-
Table 4
Ongoing sense-making: Cabbies become more sensitive to CabLink differentially

<table>
<thead>
<tr>
<th>User-groups</th>
<th>Innovations in work practice</th>
<th>Ongoing technology sense-making (illustrative quotes)</th>
<th>Technology uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time 0: Before CabLink Adoption (&lt;1998)</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Nomadic</td>
<td><em>Moving</em>: Searching for passengers by moving around the city. Cabbies cruised around familiar streets and queued at taxi stands, occasionally receiving radio-dispatches</td>
<td>No sense</td>
<td>‘Driving a taxi is a time-critical job. The more you work, the more you earn. On lucky days, I could take in passengers to recover my rental in half a day. On bad days, I would cruise the streets searching for passengers and praying for radio-dispatches’</td>
</tr>
<tr>
<td><strong>Time 1: Initial Adoption of CabLink (1999–2000) – initial sense-making</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sailor</td>
<td><em>Optimizing</em>: CabLink provided an optimal dispatching method to search for passengers. At peak hours, cabbies could earn more income through CabLink dispatches. Vehicles’ redundant time was significantly reduced</td>
<td>CabLink as <em>Beacon</em></td>
<td>‘Before CabLink was available, I drove around familiar areas to find passengers. It was very difficult to plan my days. CabLink is like a beacon; it guides me as to where and when to go and reduces my vehicle vacancy time’</td>
</tr>
<tr>
<td>Hunter</td>
<td><em>Preying (focus on precision)</em>: Finding passengers at dispatch hot-spots. The <em>hunter</em> cabbies developed technology-induced knowledge and were familiar with ‘zero-points’, which identified the caller’s location as defined by the GPS-based electronic maps</td>
<td>CabLink as <em>Detector</em></td>
<td>‘CabLink is a bit like radar. I can locate passengers. All I need to do is to drive to these places and wait for their booking calls. It reduces my fuel expenses and gives me more time for lunch’</td>
</tr>
<tr>
<td>Fighter</td>
<td><em>Battling (focus on speed)</em>: Snatching passengers at crowded and high-traffic areas. The <em>fighter</em> cabbies were street-wise in developing rich geography-related knowledge. They were familiar with streets and shortcuts to accomplish jobs quickly</td>
<td>CabLink as <em>Navigator</em></td>
<td>‘To compete with so many taxi-drivers, I must fight for a living. So, when you see one; you kill one (i.e. get the passenger). CabLink helps me to identify all possible incoming jobs. With CabLink, I can detect more passengers and snatch them at once’</td>
</tr>
<tr>
<td>Traveler</td>
<td><em>Encountering (focus on screening)</em>: Selecting the right passengers. The <em>traveler</em> cabbies developed substantial people-related knowledge (e.g. when people will visit the aviation show at the Expo). They preferred to select passengers through CabLink so as to avoid potential risks and achieve some form of self-cultivation through learning from passengers</td>
<td>CabLink as <em>Explorer</em></td>
<td>‘I wish I could take every booking; but I cannot. Sometimes you might get the wrong people from a night club throwing up in your car. Or, you might take the wrong job and get stuck in traffic. The best way to use CabLink is to ferry the expatriates from the black-and-white bungalows. They give good tips and teach you a lot’</td>
</tr>
<tr>
<td>Dweller</td>
<td><em>Dodging (focus on safety)</em>: Sticking to a routine and trying to avoid CabLink. The <em>dwellers</em> developed substantial location-based knowledge. They perceived that CabLink brought about more trouble than convenience. But they liked CabLink because it could help locate lost and stolen vehicles</td>
<td>CabLink as <em>Guardian</em></td>
<td>‘The more booking calls you get from CabLink, the more trouble you have. The words shown on the MDT are so tiny. I might bump into a tree while reading them. Even if I could read the words, I might not be able to find the address. It’s better to queue at the airport’</td>
</tr>
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</table>
ing more cabbies. At the fourth stage, triangulation and verification were conducted to enhance authentic interpretations of cabbies’ practices.

Stage 1: Initial sense-making around CabLink. The focus at this stage was to analyze: (1) cabbies’ general work practices before the adoption of CabLink, and (2) cabbies’ initial sense-making and new working practices induced by CabLink. Users’ initial senses toward CabLink were analyzed through three triggering conditions – novelty, discrepancy, and deliberate initiative (Griffith, 1999; Louis & Sutton, 1991), which explained the motivation of managers and cabbies in adopting CabLink (as in Beacon; see Table 4).

Stage 2: Ongoing technology enactments and new sense-making patterns around CabLink. At a later stage, with the addition of real-time longitudinal analysis, we began to discern different work practices enacted by CabLink, and observed additional sense-making patterns. Using inductive coding (Miles & Huberman, 1994), we found that, through the daily use of CabLink, cabbies became more experienced in exploiting CabLink in the course of their work and developed different understandings around CabLink. In addition, new senses were made by users who gained more experience with the technology, i.e. they viewed CabLink as detector, as navigator, as explorer, and as guardian (see Table 4). At this stage, we engaged in real-time tracing of cabbies’ practices to examine their actual usage of CabLink. The first and third researchers conducted independent coding, while the second researcher served as a facilitator to negotiate tensions between two different sets of sense-making patterns. In a reiterative process, these four sense-making patterns were emerged as we coded data by grouping similar user-groups (hunter, fighter, traveler, and dweller), and these were validated by cabbies in each category.

Stage 3: Refining the coding scheme. Our focus at this stage was to extend our understanding of how the cabbies’ emergent work practices might lead to new patterns of technology sense-making. We conducted more fieldwork in tandem with the analysis of the four new senses, so as to test the robustness of the categorization. As we learnt more about the cabbies’ concerns in their everyday work, we began to explore their various tactics of using CabLink. In each user-group, we tried to understand how different categories of cabbies used CabLink to cope with their hectic routines, deal with risks, and avoid the company’s punishment mechanism. We asked cabbies to explain their interpretations and appropriation of CabLink. Such data sets allowed us to refine the coding and improve data reliability.

Stage 4: Triangulation and verification. At the last stage, the findings were presented to managers and cabbies for testing their generalizing power (Table 4 provides a summary). To address the reflexivity issue and prevent the interpretation of the social realities from merely being the researchers’ monologues, we conducted ‘member-checking’ (Lincoln & Guba, 1985 p. 314). The analytical categories, interpretations, and conclusions were tested with members from whom the data was originally collected. Their feedback was incorporated into our ongoing analysis. Moreover, we discussed our findings with the technology vendor in order to keep abreast of the changes in CabLink’s features.

4. Research findings

This section is divided into five subsections. The first subsection explains the existing conditions before CabLink was implemented. It analyses how cabbies made initial sense of CabLink and how the work practices were changed by CabLink. Sections 4.2–4.5 examine how four distinctive groups of cabbies enacted new work practices with/around
CabLink during the transitional adoption period. Each subsection elaborates what work transformations CabLink enacted and how cabbies made new senses from their ongoing use of technology. Table 4 describes the ongoing sense-making around CabLink. However, we must note that the four patterns of sense-making represent the ideal types; they are neither mutually exclusive nor exhaustive.

4.1. Initial sense-making: CabLink as ‘Beacon’ (Time 1)

The period before CabLink adoption: Before CabLink was implemented, most cabbies cruised on the streets or waited at taxi stands to look for passengers. Since Singapore is a relatively small city, cabbies often use the city centre as a hub to seek passengers traveling to different regions. Due to information asymmetry, the cabbies’ practices were largely inefficient, their productivity was not maximized, while Comfort’s vehicle maintenance costs remained high, and passengers wasted time finding taxis. Cabbies were like ‘nomads’ trying to move around the city to maximize vehicle exposure in order to attract passengers. The earlier tool used for assisting vehicle dispatch was radiophone technology. Typically, passengers would ring the dispatch centre and the service staff would broadcast the booking to all cabbies. Cabbies would bid for the task by stating their estimated arrival time (EAT) to the dispatch centre.

However, the radio-dispatch method incurred four main problems. First, the radiophone could only disseminate messages regionally. During this period, a critical mass of users was unavailable. Passengers were frustrated with long waiting times and ineffective dispatches. Second, to maximize economic gains, more and more cabbies were competing on dispatch tasks by underbidding the EAT. A cabby who was 10 blocks away from the passenger would bid a 5-min arrival time to wrest the job from another cabby who was just one block away. This practice was a potential cause for accidents as the cabby tended to rush to the destination. Worse still, cabbies could collude with the service staff to receive more calls. Hence, most cabbies perceived that radio-dispatch was not entirely a fair dispatching method. Third, the service staff frequently broadcast wrong destinations to cabbies due to poor reception or human error. Even when the cabbies were given the passenger’s pick-up point distinctly, they were likely to forget the destination en route. Fourth, it was difficult for the radio-dispatch centre to provide a passenger’s exact location due to technological limitations, such as broadcasting range and sketchy location identification. The general public perceived radio-dispatch as noisy (causing unpleasant experience during the journey) and that it posed health hazards (because of the concern with exposure to radiation from radio-transmission).

Initial sense-making towards CabLink: The initial adoption of CabLink triggered new perceptions of vehicle-dispatch among cabbies. First, the novelty of CabLink made many cabbies think that the technology would bring them a professional identity and enhance their social status. For Comfort executives, CabLink would offer a new operational model for managing its taxi fleet and improving supply chain efficiency. Secondly, cabbies could easily see the discrepancies between radio- and computer-mediated dispatch, in terms of better technical capabilities (CabLink was capable of covering the entire island of Singapore); improved communications (the pick-up address could be displayed on the screen and spelled out by a computer-generated voice); and enhanced customer services (CabLink is capable of locating any specific vehicle in real-time while the electronic signal is perceived to be not hazardous). Lastly, by using the MDT, cabbies are able to interact with
CabLink by switching between the automatic and manual modes, as well as to press buttons to bid for tasks, and retrieve pick-up addresses. Through these deliberate initiatives, CabLink was perceived by cabbies as a fairer dispatching method because they felt that they were working with computers rather than the potentially colluding human agents. “Computers won’t cheat,” was a general impression perceived by most cabbies. Cabbies perceived that, the more they used CabLink, the higher would be their incomes because booking surcharges would be added to their bank accounts through the computer. CabLink was thus swiftly adopted by cabbies.

As a whole, cabbies perceived CabLink as a ‘Beacon’ while they considered themselves as ‘sailors’ in the ocean. With CabLink, they could discover whether there was a passenger nearby. Cabbies felt that CabLink would bring them to customers one after the other as “a beacon guiding sailors to the shore during the dark night”. This computer-beacon could also show them the exact way to reach customers as they could retrieve addresses from electronic maps. CabLink was also a ‘beacon of hope’ in troubled times too. These included times when they worry about vehicle vacancy, which means no income is being generated. At times when they worry about vehicle security, CabLink is capable of locating their taxis in real-time through satellite tracking. Moreover, when they worry about robbery, they can use CabLink’s emergency button to call for immediate help.

Optimizing practices: The driving practices of the cabbies were altered by CabLink. Before CabLink was introduced, cabbies drove around areas with which they were more familiar and mostly near where they lived. With CabLink, more cabbies went beyond their ‘comfort zones’ as dispatch tasks forced them to become familiarized with other places in Singapore. The cabbies established new work routines and gained new spatial and temporal knowledge, when they accumulated heuristics on passengers’ pick-up points through CabLink. For example, one cabby initially plied the routes chosen by his passengers. Using CabLink, he began to develop a driving routine: in the morning, he moved between Changi Business Park on the east coast and a particular residential area, because he was able to pick up frequent dispatches from expatriates living in this area. In the early afternoon, he drove to the city centre to pick up people going out for lunch in the downtown district. Later in the afternoon, he took a break in a car park near a commercial building to wait for ‘call bookings’ in order to earn the late afternoon surcharges.

Through CabLink, cabbies moved beyond their initial geographical boundaries to explore more business opportunities. They came to learn more about passengers’ temporal movements in different locations. For example, some cabbies found frequent dispatch jobs in the Orchard Road area, i.e. a shopping and commercial hub, and at the Woodlands Shopping Centre in the north. In these places, passengers would book taxis to avoid the long queues. An alternative routine was exhibited by another cabby’s practices: picking up office ladies from 6 to 8 pm at Raffle City (an office tower complex in the city); professionals from Raffles Place (the financial district) at lunch time; late-night crowds going home from night clubs and cinemas. Previously, such customer information was not fully made available to most cabbies. With CabLink, cabbies became more effective in seeking passengers and reducing their vehicle redundancy. They worried less about ill-intended competition, enlarged their cruising territories, and found CabLink useful in generating more revenues.

The early adoption of CabLink has led to a visible improvement in supply chain performance. For Comfort, CabLink provided an effective way to govern its taxi fleet and normalize cabbies’ practices. Using CabLink, the management could supervise vacancy
rates, monitor vehicle routes, and prevent vehicle misuse. Comfort managers could have full control of cabbies and identify any problem at the earliest time.

Over the years, as we observed, new types of work practices began to spring up as a result of different user-groups’ ongoing interaction with CabLink. Hence, four types of work transformations have emerged and cabbies have come to make more new senses around CabLink and perceive it as detector, navigator, explorer, and guardian. The next four subsections elaborate on the four patterns of technology enactment to account for why these four new senses evolved.

4.2. Sense-making #1: CabLink as ‘Detector’ (Time 2)

Emerging work practices – preying: The cabbies of the first group exhibit a ‘preying’ type of work practice and may be called ‘hunters’. The hunter cabbies had a thorough understanding of CabLink’s functionalities. They investigated technology features and developed rich technology-related knowledge. These cabbies established a mental map of ‘hot-spots’ (i.e. places where they would have a high probability of receiving dispatch jobs). A typical practice was to wait in hot-spots, such as industrial parks, industrial districts, commercial centers, and areas where public transportation is unavailable.

Hunter cabbies used ‘zero-point’ locations to find their hot-spots. When CabLink receives a call, the system searches for the location, and sends the axis position back to the dispatched taxi’s MDT. When the taxi arrives at the caller’s premises, the MDT would then indicate ‘0–0’ (i.e. a zero-point location) on the screen. However, it is quite likely that the GPS-based electronic map may not match the exact geographical location. For example, the ‘zero-point’ of a chemical company in the Jurong Industrial Park in the western zone of Singapore was actually three blocks away from the main building. In another case, the caller’s office was located in newly-reclaimed land, which had not yet been programmed into the electronic map by the computer system, and thus the zero-point was in a different location. This also explains why, when a dispatch job is received, the hunter cabbies will drive around the area to find the zero-point of the caller’s location before picking up the passenger.

Typically, the hunter cabby’s traveling routine was between the zero-points and the dispatch destinations. Once a cabbie had completed a job assignment, he would cruise around the nearby area to search for passengers en route to his next hot-spot. Otherwise, he would return directly to the nearest ‘hot-spot’ to wait for the next dispatch while taking time to catch up with news or take a tea break. As a cabby explained, this practice resembles that of a wolf preying in front of a hare’s cave: once the hare is out, the wolf will catch the prey and return to the same cave (or other familiar caves) to wait for the next hare to come out.

The hunter cabbies were based at particular condominiums and industrial parks. In each area, they occupied specific ‘turfs’. In the industrial parks, the hunter cabbies preferred to take ‘bow-die’ callers, i.e. passengers who needed to commute to the ‘city centre’ on business. This is because the cabbies could easily collect US$10–15 on each trip, and also because generally such passengers were more gentle so that fewer inflammatory situations would be encountered. Other hunter cabbies chose to habituate nearby factories so that they could pick up callers needing to buy dinner for night-shift staff. They could easily collect up to US$20 for each round-trip. During peak hours, such as from 2 to 4 pm, they could pick up 10–18 calls in one location for short-distance traveling within industrial parks. This explains why the ‘hunters’ are sensitive to temporal practices. They pay attention to booking
calls during peak hours: during the morning rush hours (from 7 to 9 am), at lunch time (11 am to 12 pm), during afternoon in-town meetings (from 1 to 3 pm), during home-bound hours (from 5 to 7 pm), night shifts (from 11 to 12 pm), and on rainy days. The surcharges from these ‘peak hours’ could comprise 30% of a hunter cabby’s daily income, thus providing an escalated commitment to the use of CabLink. A hunter cabbie commented:

   I know at what time and where I can receive booking-calls. It’s a waste of time, money and energy if you always cruise around the streets. I would rather wait in ‘hot-spots’, such as the Jurong East industrial parks, and, guess what, I could always receive 15–20 booking-calls a day, on average. The secret is: if your vehicle stays in specific areas and is always in ‘auto mode’, the satellite system will ‘recognize’ you and route dispatches to you first. So, you will keep receiving booking-calls from CabLink.

**Emerging technology use – efficient appropriation:** The hunter cabbies in general employed an efficient mode for technology use. They switched the MDT to automatic mode at specific hot-spots in anticipated time slots to pick up passengers making booking calls. For them, the economic incentive was to earn the booking call surcharges and achieve minimal operational costs, including the lowering of maintenance costs; a reduction in traffic accidents (thus saving on insurance costs); and considerable saving on fuel costs brought about by cruising in fewer traffic jams. One hunter cabby even designed a ‘golden finger’ to help him capture booking calls. This device is a long wooden stick, with a hook at one end. With this, a cabby can make contact with the MDT while taking a nap, without having to lean forward.

**Making new sense: CabLink as a detector.** The hunter cabbies perceived that survival in this competitive environment requires precision. They have come to regard CabLink as a ‘detector’, which identifies precise zero-points. With this ‘detector’, the ‘hunters’ have developed a sense of satisfaction with their occupation, as they feel that they are capturing customers, rather than waiting for them. CabLink is perceived as a ‘radar detector’ which seeks prey in the wild. This is the noteworthy observation of one hunter cabby:

   As a cabby, I would feel very nervous if my car is empty. I need to find passengers in the most efficient way – with minimal waste of fuel and by bringing in money quickly. I need to compete with more than 20,000 cabbies in the city to catch limited ‘fish’. CabLink is a ‘detector’ and helps me reach the ‘fatties’ (rich people) in the condominiums and business parks. These passengers are wealthy and are less sensitive to surcharges.

As a ‘detector’, CabLink was perceived by the hunters as bringing about a reduction in uncertainties concerning scheduling of their jobs. Three motives were frequently mentioned: (1) the system is fully exploited to justify the rental; (2) the operating costs of vehicles are minimal; and (3) incomes are maximized through receiving surcharges for each dispatch job, while they enjoy longer breaks. Another hunter cabby explained how he uses this ‘detector’:

   CabLink helps me to find zero-points and bring in ‘smart money’. In Singapore, every booking-call surcharge fetches S$3.20 (US$2). That’s a major source of income for me. Since the rentals for CabLink are rather high, there is no reason why we should not fully exploit the system.
4.3. Sense-making #2: CabLink as ‘Navigator’ (Time 2)

Emerging work practices – battling: The second group of cabbies can be called ‘fighters’, i.e. they are like fighter/aircraft pilots. Many of them face financial pressures for various reasons, such as bankruptcy, job redundancy, family problems, and debts; and they are ready to take risks in order to generate more income. The fighter cabbies are concerned with speed and vehicle mobility. They prefer not to queue at taxi stands but to cruise around the city centre or nearby commercial districts to maximize their chances of finding passengers or receiving dispatches from CabLink. Unlike the hunter cabbies, the fighter cabbies were less sensitive to time-related costs (i.e. income per hour) and were better at improvising their routines. They perceived that maximum exposure in the ‘open space’ would increase the chances of being selected by the satellite system. Especially, they worked closely with their ‘relief drivers’ (part-time partners sharing the vehicle rental) to ensure that their cabs were fully utilized. Even though the fighter cabbies spent an average of 12–16 working hours, their average monthly income of approximately US$1200–1600 was still lower than that of the hunter cabbies who fetched an income of approximately US$1800.

CabLink helped the fighter cabbies develop a rich geographical understanding of the city, from the main streets to small alleys. Through CabLink, the fighter cabbies extended their reach to different places in the city. They knew many tourist spots, landmarks, architectural highlights, and places that few other cabbies knew of, such as specific residential areas where certain celebrities dwelt. The fighters were more sensitive to turnover rate, aiming at picking up passengers one after another. To maximize their incomes, they were sensitive about prime time slots, i.e. from 7 to 9 am and from 5 to 7 pm when the surcharge could be as high as an extra US$4 per trip. They carefully monitored travel during the hours when the Electronic Road Pricing (ERP) tolling system was operational to minimize operational costs. Unlike most toll systems in the US and other places which operate 24/7, in Singapore, ERP tolls vary according to the time of day or day of the week so as to regulate traffic conditions (the highest tolls being from 8 to 9 am and from 5 to 6 pm).

The fighter cabbies were not afraid of ferrying passengers to unpopulated places. In fact, they welcomed challenges and were excited about driving to unfamiliar destinations. We often heard comments similar to this one, made by a fighter cabbie: “I’m very familiar with the city. There is no place within it which I cannot find.” Many fighter cabbies also habituated nightclubs, Karaoke TV lounges and riverside bars on weekend nights. Although they might risk encountering unpleasant passengers, such as drunkards throwing up in the car, they enjoyed both the adventures and premium tips given by such passengers.

Emerging technology use – aggressive exploitation: The fighter cabbies adopted maximum use of CabLink’s system. Most of the time, they chose to set CabLink in the automatic mode while cruising. Their motive was to increase the chance of being ‘selected’, either by serendipitous passengers or by CabLink dispatch. Since the fighter cabbies were familiar with geographical conditions even in the manual mode, they showed great confidence and were competitive in bidding for any dispatch task. For instance, CabLink allowed cabbies to use the ‘can-bid’ function to receive the next booking call, under the automatic mode, while they were fulfilling the current job dispatch. However, a risk was involved. If there were two passengers in the same taxi traveling to different destinations, and the cabby received another automatic dispatch under the ‘can-bid’ mode, the
fighter cabbie might have to ‘abandon’ the second passenger in order to avoid punishment for missing the second job he had accepted. Although the second passenger might lodge a complaint, the fighters were prepared to take such a risk which, for them, was relatively lower than not arriving at the next destination on time.

*Making new sense – CabLink as a navigator:* CabLink made the fighter cabbies street-wise and sensitive to locations of high population intensity. One street-wise fighter cabby remarked confidently, while he was cruising and observing both sides of the road for potential clients:

I drive around the island. I know the place inside out. If I take a passenger to the airport, I will cruise around Changi Industrial Estate [near the airport] because I can run into commuters going to the city centre for business purposes. If the job takes me to Bukit Batok, I will then drive around Choa Chu Kang [where there is no MRT – Mass Rapid Transportation]. You bet I can easily get a dispatch call or pick up the area’s residents.

The fighter cabbies considered CabLink as a ‘navigator’ guiding them to find passengers through heuristic pick-up points. A fighter cabby thus describes his connection with CabLink: “I’m like a fighter jet pilot cruising in the sky; CabLink can quickly direct me to the enemies and shoot them down.”

While driving, the fighter cabbies were not keen to engage in social conversation with their clients, but focused on scanning the surroundings with the aim of spotting the next passenger. Their belief was that taking risks is necessary to save time, to increase vehicle mobility, and to maximize income. For instance, one fighter cabby had just reached a highway exit when he received a dispatch (Note: on the highway, most cabbies normally would switch the MDT to the manual mode). He accepted the job, reversed the vehicle back onto the highway, thus ending many drivers at the exit, before driving to the next exit point to reach the caller. The fighter cabbies were willing to take such risks knowing that they could be punished by the company, if customers should lodge complaints against them for failing to turn up.

4.4. Sense-making #3: CabLink as ‘Explorer’ (Time 2)

*Emerging work practices – encountering:* Cabbies in the third group can be termed as ‘travelers’ who value the freedom of organizing their work routines and dislike being monitored by technology. Through CabLink, the traveler cabbies have target customers in mind and have developed people-related knowledge. For instance, they are sensitive to cruising around specific residential areas in the morning to pick up office-goers; driving to hospitals in the afternoon to pick up outpatients; to exhibitions halls during specific events to pick up audiences or visitors; as well as to the zoo (near Woodlands) or the bird park (in Jurong) on Saturdays and Sundays to pick up tourists and family visitors. One traveler cabbie described a typical routine:

Between 7 and 9 am is the peak period; everyone is going to office. I can drive to Sunset Avenue [a residential area] and easily find people going into town to work. Between 11 am and 1 pm, many outpatients are leaving the hospitals; I can drive to any of the five major hospitals in Singapore to pick up patients. On Saturday or Sunday, people will sleep late and it’s time for family get-togethers. I will go to
residential areas around 11 am to pick up people going out for ‘Dim-Sum’ [Chinese brunch]. Driving is all about ‘people’ business!

Many traveler cabbies were found to be fond of learning new things from different walks of life. They were inquisitive and exploited every encounter to learn about passengers’ riding behavior and potential business opportunities. For example, a 45-year-old cabby who was a retrenched engineer, had a wide-ranging knowledge of the various exhibitions held at the Singapore Expo, an exhibition mall on the east coast; and of art museums as well as the Singapore Exhibition Centre in the downtown area. He knew of the major events of each month, such as a fashion show held at the Singapore Expo in early November. Accordingly, he scheduled his driving routines around the major events. Another cabby, who was in his early 40s and a former civil servant, was sensitive to special events for different ethnic groups. He knew when to pick up Japanese families from the Changi Senior School on Sundays (at 11:30 am), after their children’s Kendo (Japanese fencing) lessons. He also knew when to pick up ethnic Malay passengers on Fridays (at 2 pm) from nearby Muslim mosques, and to head for the turf club to pick up gamblers on late Saturday afternoons. Although the traveler cabbies had known some of these routines before technology adoption, CabLink helped them become more sensitive to ‘people’ oriented knowledge.

For instance, in picking up a caller, a traveler cabby (a retired policeman) initiated a conversation with the passenger to learn more about his lifestyle and learnt that he was a regular golfer. From the conversation, he heard about the golf club’s activities and golfers’ routines. He added the golf club to his list of favorite pick-up points. Thereafter, when he happened to drive by the area, he would park in a nearby building to wait for dispatches. Another traveler cabby, with a tour guide’s license, installed a Karaoke set (with more than 500 VCDs) in his taxi. When he sensed that the passenger might like the idea of singing along in the car as a way to ‘release stress’, he would offer the Karaoke service immediately. As a result, he made many friends and had regular customers.

Emerging technology use – selective application: The traveler cabbies employed a selective mode of using CabLink in response to their relation-based tendencies and risk-avoidance attitude. They usually set their MDTs to the manual mode and cruised around ‘golden-places’. With people-related knowledge, they used CabLink selectively so as to choose the ‘right’ passengers – by knowing where they were, how they worked, and when they moved. Since the traveler cabbies were more concerned with the penalty mechanism and unexpected incidents, they would bid on dispatch tasks with great discretion. A traveler cabby defined his stand:

When CabLink dispatches an ‘on-call’ task to me, I pay extra attention to reading the message. I will be cautious to take calls that don’t specify any pick-up location and destination, or calls from the main streets. These customers may easily cancel the booking without prior notice to save their on-call surcharges. But if a caller is based in areas like Newton (where there are many private villas) or from the universities (which mostly are far removed from the city centre), I’ll definitely bid for these tasks.

Making new sense – CabLink as an explorer: The traveler cabbies perceived CabLink as an ‘explorer’, or a people-finder. They liked the idea of having the choice of not having to do something, of selecting the destinations and the passengers. For instance, traveler
cabbies would not like to bid for a task requiring them to fetch children from schools, because of the long queues outside the schools during peak-traffic times. They were selective about the type of passengers to pick up. A cruising traveler cabby explained:

You see, right now there is an ‘on-call’ job coming. The MDT shows that a passenger is booking a cab to go to Sunset Avenue with an animal. I will certainly not take this booking because the animal will leave a strange smell in my car (for him, another less preferred thing is the durian, which is an odiferous fruit emitting an odor which is offensive for some). It will cost me more money to get rid of the odor.

The traveler cabbies were inquisitive about their passengers’ preferences. In being inquisitive, they had two purposes in mind. First, they could assess the risk of being robbed or verbally abused by passengers. Second, through social conversations, they could obtain important information about the prospective passenger’s routines and predict the likelihood of getting other customers in the same location. The traveler cabbies were sensitive to the kind of passengers who boarded the taxi, and tried to remember the ‘golden-places’ such as the previously-mentioned golf club.

The traveler cabbies scheduled their itineraries with their people-bank in mind. When they drove a passenger to a specific location, they thought of it as another chance to make friends, learn about novel experiences, and gather business intelligence. For them, CabLink serves as an ‘explorer’, like search engines Google or Yahoo, to guide them to the right (golden) place, to meet the right people or avoid meeting the wrong people, and to achieve some form of self-cultivation through learning from passengers.

4.5. Sense-making #4: CabLink as ‘Guardian’ (Time 2)

Emerging work practices – dodging: Cabbies in the fourth group can be described as ‘dwellers’ and many of them are senior citizens, aged between 60 and 70 years. The dweller cabbies expected little from the dispatch system, constantly setting the MDT in the manual mode, and disabling the sound system of the MDT. They were not competitive enough to queue in the taxi stands in the city centre. Therefore, they preferred to queue at taxi stands in specific locations under ‘institutional protection’ such as airport taxi depots, the Malaysia–Singapore border checkpoints, and taxi stands in industrial parks on the outskirts of the city. They perceived that their chances of getting business would thus be secured. The surcharges at these points were higher, i.e. approximately US$3.5 at the airport; while the average fare was about US$13–22 for long-distance trips. Hence, even though there might be a longer queuing time, the dwellers could make a reasonable income. This is the opinion of a dweller cabby:

I only commute between the airport and hotels, apart from other familiar places. The business that appears on the MDT screen seems remote to me – I regard them as something to be watched but not to be touched. I am too old to compete for the bidding jobs. Well, if I can get 6–8 trips from the airport, getting the surcharge is better than bidding for CabLink-dispatched jobs.

Their practices were not directly enacted by CabLink, but resulted from the competitive pressure induced by CabLink. The dwellers based themselves in specific habitats where competition was less intensive. For instance, one cabby operating at Changi Airport preferred to stay in Terminal 2 because it would be more likely for him to pick up international
passengers going to downtown hotels. He did not like Terminal 1 because he often picked up domestic passengers traveling to residential areas which he might not be familiar with. Another cabby shuttled domestic passengers between residences and shopping-tour bus stops in nearby Chinatown, a popular pick-up destination for shopping tours taking passengers to nearby Malaysian cities for weekend shopping; a popular pursuit as most items in Malaysian supermarkets are sold at half the prices of those in Singapore. This is because of the high Singapore dollar.

**Emerging technology use – perfunctory adoption:** The ‘dwellers’ were more conservative towards technology and exhibited a perfunctory use of CabLink. They were afraid of booking calls that went beyond their comfort zones, i.e. places they were unfamiliar with. They were especially fearful of Comfort’s credit-deduction mechanism. As part of this mechanism, Comfort deposited US$125 into every cabby’s account as an incentive. For every customer complaint a cabby received, Comfort would make a deduction of US$13 from his account. Once cabbies’ accounts were empty, the firm would deduct money directly from their bank accounts. This is the key reason why the dwellers preferred fewer dispatch calls and less interaction with CabLink. Comfort closely monitors every cabby’s CabLink usage and a policy stipulates that each cabby must use CabLink at least 90 times within a month. Although CabLink was designed to rationalize cabby activities through required use, the dwellers also developed tactics of perfunctory responses to calls just to meet their quotas. They would switch to the manual mode and habitually bid for the 15-min ‘EAT’ at the latest possible moment. In this way, they deliberately lost every bid. CabLink was often set in the manual mode for optional use. This is the frank opinion of a dweller cabby:

> I dread using the ‘auto mode’ because most of the time I may be unable to commit to the task. If a customer lodges a complaint against me, because of delay or no-show, I would have to go to the company for a ‘coffee time’ (i.e. for an investigation). This is not just a waste of time; it’s a risk not worth taking.

**Making new sense – CabLink as a guardian:** For the dwellers, CabLink was perceived more as a ‘guardian’, protecting both their personal safety and their vehicles from theft. The texts shown in the MDT screens were too small for their feeble eyesight and the computer-generated voices were too noisy and distracting, and regarded as potential triggers for road accidents. The dwellers were concerned that if they failed to find a caller’s location, they would have to be penalized by the company. They were also afraid that CabLink might disrupt their customary routines. This is the concern of a dweller cabby:

> CabLink is less useful to me. I only take the airport jobs. If I set the MDT on ‘auto mode’ while I’m in the airport queue, a dispatch job could mean big trouble. I may not know the caller’s address and, even if I do want the job, I cannot get out of the long queue at the airport.

Frequently, the dwellers were familiar with the main streets and did not monitor road conditions. Their main interest in CabLink centered around the ‘emergency button’ hidden in the MDT, which helps them to locate missing cars or inform the dispatch centre if they are in trouble. Generally, the dwellers had developed a good knowledge of the places sheltered by certain institutions, such as checkpoints, airports and shopping centre taxi stands as well as the incentives attached such as extra surcharges, routine pick-ups and long-distance transportation. They were sensitive to technology surveillance and developed ways to work around the technology. For them, CabLink served more as a lucky charm.
5. Research implications

The lens of sense-making offers a useful way of understanding how the use of technology may be shaped by users’ socially-constructed meanings. This article extends this line of inquiry and suggests an investigation of ongoing sense-making towards technology (echoing Weick, 1990). By examining the ongoing structuring of technology and habitual practices, our study explains how vagaries of technology use could surface and why more senses could be made by users. Our detailed analysis of ongoing technology enactments, changing work practices, and emerging senses around technology provides theoretical and practical insights.

5.1. Theoretical implications

This article adds to current theoretical development in at least three aspects. First, concerning technology sense-making literature, our study highlights that, if we want to gain a holistic picture of technology sense-making, we need to examine the whole technology adaptation process: initial adoption (making initial senses toward technology), transitional adoption (making more senses around/with technology) and post-adoption (technology becomes commonsense and users become senseless). Prior studies have extensively examined different initial sense-making patterns (e.g. Gopal & Prasad, 2000; Prasad, 1993; Siino & Hinds, 2004). We know in what way technology may become more sensible to users, and why users may adopt or reject that technology (Barrett, 1999; Henfridsson, 2000; Karsten, 1995; Orlikowski & Gash, 1994; Schön & Rein, 1994). On the other hand, to a certain extent, the previous studies have also suggested how technology may be institutionalized within organizational routines and how in the long-term users become senseless to technology use (Edmondson et al., 2001; Kling & Iacono, 1989; Orlikowski et al., 1995; Tyre & Orlikowski, 1994; Zuboff, 1988).

But, we understand relatively little about how additional senses may be made from ongoing structuring of technology during the transitional adoption stage. As Weick (1990) queried decades ago, when users interact with technology in practice and become more sensitive to the full potential of technology, how may they make more new (rich and limited) senses? Although several studies have attempted to investigate sense-making during the work structuring stage (Bansler & Havn, 2004; Henfridsson, 2000; Siino & Hinds, 2004), these studies have largely examined initial sense-making while paying insufficient attention to work practice in situ. Several studies also suggest that the enactment, selection and retention of people’s sense-making cannot be detached from their work environment (Griffith, 1999; Hinds, Roberts, & Jones, 2004; Weick et al., 2005). However, little evidence to press home this point is found thus far.

Our study offers a seminal analysis and explains how ongoing sense-making can be further fashioned by different users’ preferred work routines. As different groups of users become more familiar with the technology, they begin to appropriate technology according to their own habitual practices, surface new ways of technology use, and make new patterns of senses that interact with dissimilar types of work practices, which designers did not anticipate. An important contribution of our study is to suggest why cabbies become more sensitive in adapting technology in many different ways, by analyzing many potentials of technology enactment (echoing Orlikowski, 1996; Orlikowski, 2000).

Our study also offers a processual view of sense-making. Previous studies are limited by observing initial technology sense-making and not examining how users’ senses could
evolve with the progress of time (cf. Dutton & Dukerich, 1991). Two exceptional studies are illustrated by the Australian broadcaster’s adoption of web technology (Spicer, 2005), and five ‘images’ of enterprise systems diffusion (Ramiller, 2001). However, these studies failed to take into account sense-making within technology structuring. Our study makes additional observations and traces sense-making within the process of ongoing work structuring (cf. Barley, 1986). Users may adopt limited initial sense-making at the beginning; however, different types of users, with different abilities of appropriating the technology, will inevitably make different senses with/around the technology. Such new insights become more crystallized as users begin to discover the technology’s new capabilities in their work context. With this knowledge, we could understand, for example, why dweller cabbies might not be able (or unwilling) to adopt work practices employed by hunter or fighter cabbies (and vice versa).

More significantly, by analyzing sense-making during technology structuring, our findings illustrate the equivocal nature of technology use. Initially, a new technology could induce intended changes in work practices. However, as users become more sensitive through situated use of technology, different users with various working habits could enact multiple work transformations and technology uses in ways that surprise the implementer (Barley, 1986; Boudreau & Robey, 2005; Markus, 1994). By analyzing the four interesting patterns of work transformation, our study illustrates ongoing sense-making during emergent technology enactments. This kind of sense-making is still ongoing, which illuminates why different user-groups could make limited senses and many different kinds of senses around technology as intense interactions that occur between users, and technology can be modeled in so many different ways (Weick, 1990, p. 2). Comfort initially implemented CabLink to minimize vehicle redundancy and optimize service operations. However, through ongoing structuring, cabbies became more sensitive to the limitations and capabilities of technology in their respective local contexts. The emergent work transformations enacted by technology are unanticipated and surprising for the management. In this regard, our findings elaborate an alternative nature of ‘technology equivoque’.

Furthermore, this study brings to the surface an additional set of sense-making patterns in the new technology context: GPS adoption. This adds to prior studies of various sense-making patterns observed in a variety of technology contexts, such as groupware adoption in consulting services in the US (Orlikowski & Gash, 1994), campus-wide computing in a US university (Schön & Rein, 1994), group-decision support systems for teachers in the US (Gopal & Prasad, 2000), computerization in a healthcare organization in the US (Prasad, 1993), and automation robots in a US hospital (Siino & Hinds, 2004), geographical information systems in Indian land administration (Puri, 2007; Walsham & Sahay, 1999), and breakdowns in automation technology in the car manufacturing industry in Italy (Patriotta, 2003). Our research on GPS further surfaces multiple sense-making patterns resulting from the restructuring of spatial and temporal practices (cf. Sahay, 1998).

Secondly, our study contributes to technology structuring literature by elaborating on the dynamics of human agency. For example, in Orlikowski (2000) work, there is only a general commitment to the idea of human agency being linked to technology enactment. Building on this literature, our study examines technology structuring to unpack sense-making and to elucidate a different dynamics of human agency (cf. reinventing and improvising technology-in-use suggested by Boudreau & Robey, 2005). Moreover, our analysis of sense-making and practice also adds to the existing research on work transformation (Barley, 1986; Orlikowski, 1996; Schultze & Orlikowski, 2004). The latter strand of literature examines
how work practices may be shaped and be reshaped by ongoing technology use. However, these studies have yet to incorporate sense-making into their analyses. Although we understand how a technology may occasion new work practices, we know little about how users may develop emergent insights around the technology as work transformation occurs. Our analysis examines various technological senses through ongoing work transformation (cf. Henfridsson, 2000; Hutchby, 2001; Orlikowski & Gash, 1994).

Thirdly, our study enriches research on the management of taxi organizations. Previous studies have focused more on the issue of trust (Gambetta & Hamill, 2005), employment relationship (Sherer, Rogovsky, & Wright, 1998), technical evaluation (Liao, 2001), service operation (McAfee, 2005; Skok & Kobayashi, 2007), and strategic change (Elaluf-Calderwood & Sorensen, 2006; Georgano, 2000; Skok & Tissut, 2003). A series of studies also cover the adoption of knowledge management systems and non-dispatch Global Positioning Systems in taxi companies in Bangkok, New York, London, and Tokyo (Skok, 2003, 2004; Skok & Baird, 2005). However, none of these studies have yet examined GPS-dispatch systems used for taxi fleet management or provided any comprehensive analysis of cabbies’ work practices in the context of technology structuring (cf. Orlikowski, 1996). Our study offers not only a new context (Singapore) but also delineates the likely changes in the modern cabby’s job brought about by emergent technologies.

5.2. Practical implications

Our study suggests two practical lessons. First, our findings suggest that technology designers should consider the work transformation and ongoing senses made around technology. An emergent problem is evident in Comfort’s experience. In implementing the next generation of CabLink by 2006, Comfort imposed a set of compulsory dispatching rules to enforce dispatch efficiency. However, without knowing cabbies’ new senses, CabLink might end up disrupting different user-groups’ behavioral routines, rather than enabling efficient work practices (echoing Edmondson et al., 2001).

In addition, our findings offer practical implications for technology adoption. In recent years, Comfort has transferred CabLink to Asian cities such as Taipei (in 2004) and Beijing (circa 2008). During our fieldwork, we learned that the system faced great difficulties over a period of six years, beginning from its inception, while being adopted in Taipei by a large taxi company. In this context, we could ask: How may the persistent resistance to CabLink be brought to the surface by analyzing Taipei cabbies’ ongoing senses? Furthermore, in September 2007, New York cabbies collectively resisted adopting the GPS and filed suit to block new rules requiring the installation of GPS (ABA Journal).³ As New York cabbies perceived, such surveillance mechanisms would jeopardize their personal freedom and infringe on their intellectual property rights, since they felt that each traveling pattern is unique. By making work more visible (Suchman, 1995), we might be able to understand these cabbies’ persisting senses around technology rejection.

As a whole, although technology is equivocal, our studies suggest that the equivocal nature can be better understood, if not managed, by examining ongoing structuring and sense-making around technology.

5.3. Future directions

Two lines of investigation may offer potential avenues for future studies. First, this study could further investigate other sense-making patterns among different user-groups. For instance, in Singapore, there are 2125 women cabbies; 627 yellow-top cabbies who have full ownership of their cars; luxury car cabbies, who drive white Mercedes Benz cars and charge a fixed rate of US$30 per trip; as well as different ethnic groups such as Malay and Indian cabbies. These patterns are worth investigation. Secondly, the analysis of sense-making could also consider power and social influence (Dawson & Buchanan, 2005; Lin & Silva, 2005; Spicer, 2005) when it is examined in a different work context which is not as regulated as the Singaporean environment, such as in Taipei.

There is a word of caution for those trying to generalize our research findings. It is not wise to generalize these sense-making patterns normatively in different societal contexts, for instance, by looking for the same patterns across different cabby communities in Taipei. It is also inappropriate to consider patterns as static which are frozen in time. We should recognize that, in a different work context, different user-groups could make new senses which may be in stark contrast to those observed in our research at different time-periods.

6. Conclusion

Our study examines why cabbies may become more sensitive to technology in different ways. As Weick (1990) suggests, sense making never really ends during ongoing structuring. Our study suggests that such ongoing structuring and sense-making should take into account the variations in different users’ tendencies to exploit technology. Our findings illustrate how multiple groups of users may exploit technology in response to their local practices, leading to distinct work transformation over time. Essentially, users’ senses are oriented towards technologies by means of their habitual activities, which help them develop further different ‘sensitivities’ through ongoing work transformation. This article widely elaborates on this core issue.

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