MoodTracker: Monitoring Collective Emotions in the Workplace

Anonymous ACII submission

Abstract **Accurate and timely assessment of collective emotions in the workplace is a critical managerial task. However, perceptual, normative, and methodological challenges make it very difficult even for the most experienced organizational leaders. In this paper we present a MoodTracker - a technological solution that can help to overcome these challenges, and facilitate a continuous monitoring of the collective emotions in large groups in real-time. The MoodTracker is a program that runs on any PC device, and provides users with an interface for self-report of their affect. The device was tested in situ for four weeks, during which we received over 3000 emotion self-reports. Based on the usage data, we concluded that users had a positive attitude toward the MoodTracker and favorably evaluated its utility. From the collected data we were also able to establish some patterns of weekly and daily variations of employees' emotions in the workplace. We discuss practical applications and suggest directions for future development.**

Keywords Ambient devices, Emotions, Field Study, Moods, Workplace Communication.

I. Introduction

Emotions in the workplace have significant impact on both processes and outcomes of employees daily activities. Affective states have been shown to influence decision making [1], creativity [2], negotiation strategies [3], and job performance [4]. Emotions of individual employees can spread and converge, creating "collective emotions" - clusters of shared emotions that can create even more pronounced and far-reaching consequences for an organization [5], [6], [7]. For example, collective emotions were found to predict absenteeism [8], in-group communication [9], team cohesion and performance [10], organizational citizenship, and other important cognitive, attitudinal and behavioral effects on workgroup dynamics [5], [6].

Despite its high diagnostic and predictive utility, information about collective affect is greatly underutilized because of the numerous challenges associated with its assessment. Organization leaders have traditionally relied on one of the two methods for monitoring collective moods: direct observations, and employees' self-reports of their overall affective state. Each of these techniques has methodological and practical drawbacks that limit their effectiveness in real life settings.

Observations are usually conducted informally by group leaders, and have a very limited utility. First, it is usually not feasible for any manager to be in constant direct contact with all the members of the group. Second, most emotions are too subtle to be detected by mere observation. Of course, there are universal prototypical expressions that people naturally associate with certain emotions, such as frowned brows of an angry person, or a Duchenne smile of a happy one [11]. However, most of such expressions correspond to quite extreme levels of basic emotions, which are relatively rare in real life. The majority of moods and cognitive states that can be of interest to organization leaders – e.g., feeling sad, accomplished, tired, or bored – have very subtle visual cues. Explicit expression of these cues can be further inhibited by the rules of professional conduct, which dictate that certain emotions are inappropriate (e.g., anger) or undesirable (e.g., boredom) in the workplace [12]. Finally, in order to accurately read collective emotions, managers need to overcome some basic perceptual biases. Masuda [13] discovered that people have a cognitive tendency for emotional tunnel-vision. Researchers asked participants to evaluate affective tone in a picture that portrayed a person surrounded by other people expressing a contrasting emotion. Participants overwhelmingly ignored the group's emotion, and focused only on the central figure. Eye-tracking data confirmed that observers did not just disregard information about the group, but narrowed their visual attention to the salient person instead of averaging all available emotion information. Thus, in assessing collective emotions managers need to be able to adjust their perceptual focus from seeing the individual "trees" to the broad pattern of the collective "forest" – an ability called an *emotional aperture* [14]. Emotional aperture goes well beyond detecting the modal mood, and also involves assessment of heterogeneity of shared emotions, proportion of positive to negative ones, dynamic changes over time, and other characteristics that are difficult to monitor [15].

Self-reports of emotions – another common method for monitoring affective climate in the workplace – are usually collected during annual employee surveys, and present their own unique challenges. Although this method has high validity [7], self-reports are also costly, and require significant effort to collect in large organizations. In addition, organizational surveys are conducted rather infrequently, and provide a one-time snapshot of the group mood, rather than constant feed of the group affective data. The latter is much more valuable to the organizational leaders, as it allows them to design timely interventions to improve intra-group dynamics, track group's morale in the times of organizational changes, and provide other actionable insights. Thus, self-reports collected via traditional methods are practically useless for continuous monitoring of the collective emotions due to the high cost, effort, and temporal gaps between affect probes. Despite this, it is the most commonly used approach.

Altogether, perceptual, normative, and procedural obstacles

make accurate assessment of collective emotions a non-trivial task even for the most experienced managers who possess a high level of emotional intelligence and strong social skills [16], [17]. Given the significant practical importance of this matter, there is a surprising lack of research on possible solutions to this problem. We aim to begin to fill this gap by designing technology that would enhance managers' emotional intelligence by monitoring a group's affective tone in real time, in situ.

II. Related Work

Developments in information technology allow researchers to experiment with alternative methods of affective monitoring. One branch of inquiry has concentrated on data available from various open channels of communications, particularly social media (e.g., Twitter, Facebook) and their organizational equivalents (e.g., Microsoft's *OfficeTalk* or *Yammer*). For example, Golder and Macy [18] analyzed over 500 million Twitter messages from 2.4 million users across 84 countries to determine temporal fluctuations in people's affect. Messages were analyzed using the Linguistic Inquiry and Word Count (LIWC, [19]), a lexical tool, to detect positive and negative affect. Researchers found that early mornings, midnights and weekends were the happiest times, suggesting a biological explanation for mood fluctuations. De Choudhury and Counts [20] also used linguistic analysis to leverage data from the Microsoft's internal microblogging tool called *OfficeTalk*. Researchers accessed more than 300,000 posts from almost 33,000 users, and used this data to explore the effects of some workplace and geographical factors on the employees' moods. These and other similar studies validate the use of social content for measuring affect, and demonstrate the ease, speed, low cost and scalability of this mood-tracking method. However, despite its strengths, linguistic analysis may find only a limited application, as it only discriminates between positive-negative affect, and does not allow for a fine-grained analysis of moods (see [20] for a discussion of other analysis issues). More importantly, this method is applicable only if group members have and routinely use an open channel of communication for work-related discussions. So far, only a few organizations have such internal social media.

Another direction of mood-monitoring research has focused on developing tools that help to recognize users' affect based on objective data: facial expressions, voice pitch, and physiological parameters. A notable example of such technology is a BioCrystal recently presented by Roseway and colleagues [21]. Researchers designed a biofeedback device that determines users' affect based on their heart rate and skin conductivity, and signals it via an ambient display that changes its color according to the predetermined mood-color map. The tool was tested by employees of a large corporation, who found it to be a very useful interpersonal communication aid. By sending the clear message about its user's state, the BioCrystal was able to convey affective states that do not have clear observable cues and would otherwise go unnoticed or misinterpreted (e.g., stress). Physiological data from such individual biofeedback devices can be aggregated to provide a picture of the group's affective state. Unfortunately, high validity and timeliness of physiological measures come at the cost of comfort and convenience. Users must remember to charge and wear sensors, be willing to troubleshoot, and commit to other efforts associated with continuous collection of biological data. In many contexts, this may present a considerable obstacle to the broad adoption of such tools.

Having considered benefits and shortcomings of available methods for tracking group-level affect, we aimed to design a technology that could be readily applied in the workplace environment. Specifically, the organizational mood-tracker would need to meet the following criteria: 1) it should ensure high validity of data; 2) it should capture specific emotions rather than general positive-negative affect; 3) data collection must be relatively unobtrusive and require little effort on the part of the user; 4) the tool should enable a continuous collection of data; and 5) data collection should not require high cost and effort on the part of the researcher.

III. Measuring Affect

There are two main approaches to defining and measuring emotions: dimensional and discrete. The dimensional model views emotions through their position on one or more axes, usually arousal (high activation – low activation) and valence (positive-negative; [22]). The discrete model posits that emotions are universal, discrete, and physiologically distinct [23], [24]. Researchers disagree on the exact classification and labels of discrete emotional states, although most studies consistently show support for six basic, or primary, emotions: anger, disgust, fear, happiness, surprise, and sadness [11]. These basic emotions can be expressed in varying degrees (e.g., *annoyance* and *rage* are different degrees of *anger*), and can blend to form more complex emotional states (e.g., *anger* and *disgust* can blend to form *contempt*).

Although the majority of current studies prefer to assess emotions based on just two dimensions (e.g., [18], [20]), we felt that data about specific emotions, rather than overall valence and arousal in the group, has a much greater utility and would allow for a more fine-grained analysis. For practical reasons, we selected affective states that are most common and relevant in the workplace environment: bored, relaxed, calm, excited, serene, content, alert, happy, fatigued, stressed, sad, angry, nervous, upset, elated, and depressed.

IV. The MoodTracker

After consideration of all the practical and methodological requirements, we designed a MoodTracker – a device intended to collect emotional self-reports from multiple users. Users reported their emotions through a simple interface presented on a shared tablet PC placed in a public place. The interface displayed 16 cartoonish faces indicating different emotions (Fig. 1). Each icon was also labeled with the name of the emotion. To report their state, users had to simply press the corresponding icon(s). Users did not have to provide any identification to enter their emotion. We believed that anonymity of the entries would encourage users to provide

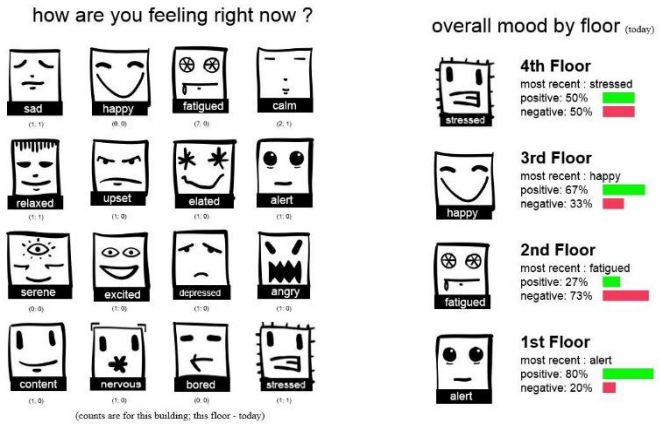

Fig. 1. MoodTracker interface

honest responses in the environment where people tend to self-censor their affective expressions. To make MoodTracker more informative and to promote its use, we also included an affect-sharing feature; on the right-hand side of the screen, each tablet displayed mood statistics for each floor of the building in which data was collected: the percentage of positive and negative emotions, the most common emotion, and the most recently selected icon.

MoodTracker consists of a web component that the user interacts with, deployed on Microsoft Surface tablets. The Web component communicates with a data service hosted in Microsoft Azure Services ("the cloud"). This service tracks all user activity, calculates all aggregated metrics, and supplies those metrics to each MoodTracker deployment so that the statistics are continually updated as users interact with the various MoodTracker devices.

V. User Study

Utility of the MoodTracker was evaluated in a longitudinal in situ usability study. Although our main purpose was to measure perception and usage of the tool, we also hoped to take advantage of the collected data, and explore temporal trends in the moods of the knowledge workers in a corporate environment.

The total of six devices (four for the first nine days) were installed in a large building of a major corporation. Tablets were placed in the coffee areas that are open at all times to all employees, interns and visitors. Shared public spaces such as these are ideal for organizational mood-tracking devices, as they are visited by almost all employees at some point of the day, and where employees usually have a moment to use them. To introduce the device and explain the purpose of the study, we also placed a brief instruction next to each tablet. The data was collected during a four-week period starting from February 28 and ending March 28. All devices were set up every morning at 8 am and removed between 4 and 4:30 pm. Although, by design, we could not identify users individually, we can safely assume that the absolute majority of them were permanent company employees: researchers, engineers, and administrative support.

Performance and usability of the device, as well as users' attitude toward it, were inferred from the actual usage data (i.e., the number of entries). We also conducted an unobtrusive observation in all six areas where the MoodTrackers were placed. One of the researchers positioned herself inconspicuously in each of the coffee lounges and recorded users' reaction to the device. Observations were conducted over the course of two days, at different intervals from 9:30 am to 4:30 pm.

VI. Results

Usage of the device: Observation Hazlewood [25] argued that evaluating ambient displays, especially ones designed for public use, is a very puzzling methodological exercise, because the very notions of "user" and "use" are not clear. Technically, anyone who can *potentially* have access to the device may be considered a user, including visitors, caterers and building maintenance workers. "Use" is also an ambiguous concept in this context, as there are different levels of engagement with the device that can be applied as usage criteria: from being in mere presence of the device, to noticing the device, attending to its information, or actually interacting with the device. Notwithstanding these issues, we took a traditional approach: we recorded the total number of people present in the target locations, the number of those who paid attention to the device for at least a few seconds, and a number of people who pressed any buttons on the MoodTracker tablet. We also recorded gender of the user, and whether or not the user was accompanied by another person(s).

During four hours of observation, we collected data about 75 people. Twenty-three individuals, or 31% of those who came to the coffee lounge, paid attention to the MoodTracker, i.e., looked at it for at least a few seconds. We assume that these users were either reading affect statistics presented on the screen, and/or were choosing an icon to enter their own emotions. Out of 23 people who took a moment to look at the MoodTracker, 10 also entered their mood.

Employees' gender did not influence usage of the device. Females (N=12) were as likely to pay attention to the MoodTracker as males ($\chi^2(1,75)=0.04$; n.s.), and entered their emotions as often as males did ($\chi^2(1,75)=1.68$; n.s.)

An interesting aspect of the MoodTracker usage was presence of other people at the time of interaction with the device. Out of 75 people observed, 28 came to the coffee areas with a colleague or two. Interestingly, groups like this were significantly more likely to pay attention to the MoodTracker than employees who came alone: 13, or almost half of all individuals who came as a group, took a few moments to look at the MoodTracker interface, whereas only 10 out of 47 single visitors paid attention to the device (χ^2 (1,75)=13.63; p<.001). We noticed that groups liked to discuss aggregate information presented by the MoodTracker – the device served as a springboard for discussion of their collective emotions, their possible antecedents and consequences. People who came as a group were also more likely to self-report emotions than were employees who came alone: 7 out of 28 vs. 3 out of 47, respectively (χ^2 (1, 75)=5.26; p<.05). Overall, this tendency for "group use" of the MoodTracker is highly consistent with anecdotal and empirical evidence that people

derive significant cognitive and emotional benefits from sharing their affective states with others [26]. We found that the MoodTracker served not only as a tool for recording emotions, but also provided a great platform for explicit sharing and discussion of employees' moods and emotions.

Usage of the device: Analysis of the entries Over the course of the study, we received a total of 3706 mood entries, or an average of 34 entries per tablet per day. Users' interest in the devices remained high for the first two weeks of the study, and then slightly declined, - probably due to the diminishing novelty effect (dotted blue line, Fig. 2).

To put data in context, we first checked for any major events that happened during the study and that could cause aberrations in the data. There were three major events in March that could potentially influence employees' moods and their use of the MoodTrackers': TechFest (a technology science fair for the whole company; 3/5-3/7), a helicopter crash in downtown Seattle (3/18), and a landslide in a rural area near Seattle (3/22). We found that employees used mood-trackers less frequently the day before the corporate science fair event and on its first day. One possible explanation is that there were fewer people in the building on those dates, as they were setting up and showing their demos. Alternatively, employees could have been too busy to use our devices at that time. If the latter is true, it means that users are less likely to self-report their moods around times of greater stress, so the results of the mood-trackers that rely on self-reports are likely to be skewed around those pivotal events.

Use of the MoodTrackers also noticeably declined after both tragic accidents on March 18 and 22. This further suggests that users may be either not interested in reporting their moods when truly emotional, or not willing to report negative moods. This explanation is consistent with the findings we report next: most entries were positive, and included primarily "professional" emotions.

Next we checked for daily and hourly patterns of users' interaction with the MoodTracker. We first compared the average number of entries from each day of the week. The use was highest on Mondays with an average of 37.98 entries per tablet (SD=4.36), then dropped on Tuesdays (M=32.08, SD=2.45), Wednesdays (M=34.5, SD=9.79), and Thursdays (M=34.33, SD=5.23), and then increased again on Fridays (M=36.18, SD=6.31; Fig. 3). The differences, however, were not significant ($F(16)=0.53$, n.s.).

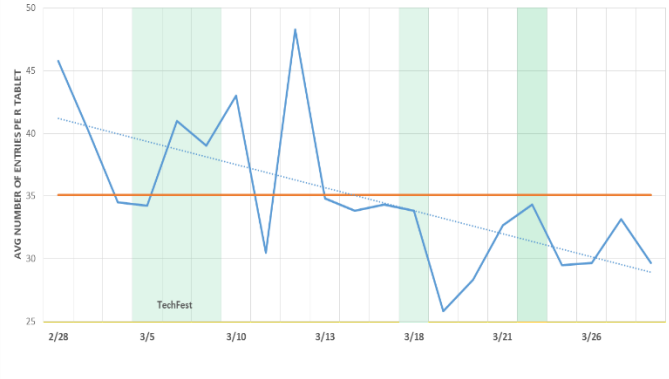

Fig. 2. Use of the MoodTrackers over the duration of the study.

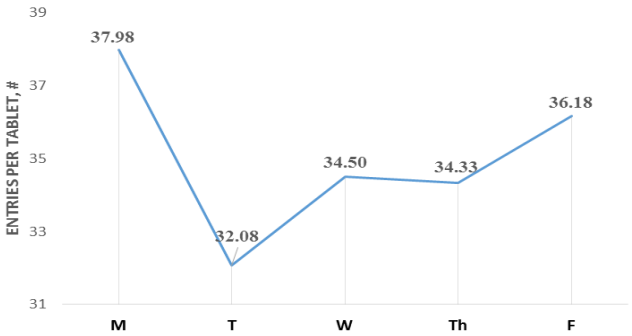

Fig. 3. The number of entries per tablet on different days of the week.

All entries were time-stamped with GMT in hh:mm:ss format. Prior to analysis, all values were converted to PST with adjustment to the daylight saving time (GMT - 9 for all entries from Feb.28 to March 12, and GMT-8 for entries from March 13 to March 28). Next, all times were grouped into half-hour intervals. However, using 30-minute intervals did not provide any additional insight, so we grouped all data into 60-minute intervals for a better readability. We then averaged all data for each hour across all days of the study. As shown in Fig. 4, mood-reporting activity had two peaks: between 8:30 and 10:30 am, and between 1 and 2:30 pm. These peaks coincide with the times when employees are most likely to be in the coffee rooms making their morning or after-lunch drinks – a finding that underscores the importance of strategic placing and easy access of affect monitors.

Analysis of collective emotions Although this was not a primary task of the present study, we took advantage of the collected data to explore self-reported moods of the knowledge workers in a corporate setting. The analysis was not comprehensive, and was only meant as a brief exercise in evaluating and interpreting data provided by the MoodTracker. Prior to analysis, we combined responses from categories that were chosen infrequently and were close in meaning to some more popular emotion categories: *elated* and *excited* were recoded into *happy*, *relaxed* into *calm*, *serene* into *content*, and *depressed* into *sad*. Thus, final analysis was conducted using eleven emotion categories. Overall, employees reported positive emotions more often than they reported negative ones (54% and 46% of all entries, respectively; $\chi 2\ (1)=20.56$, $p<.001$).

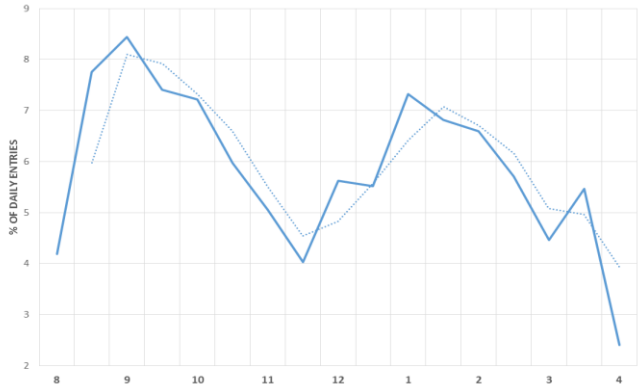

Fig. 4. Hourly variations in use of the MoodTrackers.

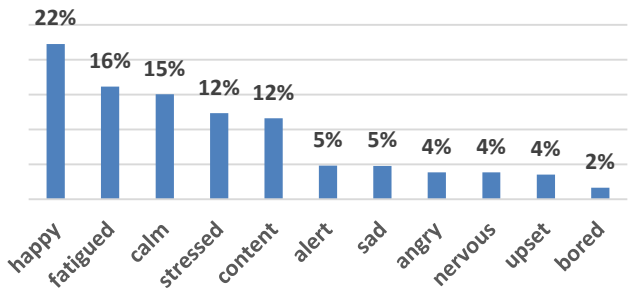

Fig. 5. Proportion of all emotions entered during the study

Happy, fatigued, calm, stressed and content were the most common emotions, together accounting for 76% of all the entries (Fig. 5). Arguably, in the Western culture these emotions are commonly seen as appropriate in the workplace [27]. In contrast, *bored*, *upset*, *nervous* and *angry* – all emotions possibly associated with "unprofessional" conduct – composed the minority of the entries.

Next we grouped all emotions into positive (happy, calm, content, and alert) and negative (fatigued, stressed, sad, angry, nervous, upset, bored) categories, and explored their dynamics. Despite some popular beliefs about "unhappy Mondays" and "happy Fridays", we found that the proportion of positive and negative emotions did not change as the week progressed: on average, mood self-reports reports were always slightly positive (Fig. 6).

Time of the day, on the other hand, did make a difference. Although the number of positive entries was always higher than that of the negative ones, the difference was especially pronounced in the first and the last hours of the workday (both different at $p<.05$; $\chi 2\ (8)=24.61$, $p<.001$), see Fig. 7.

For a more detailed analysis, we next explored the dynamic changes in reports of specific emotions. We first calculated the average frequency of each emotion on each day of the week, and then computed the proportion of that emotion among all the entries on that day of the week (Fig. 8). The Chi-square test revealed that the frequency of some emotions changed as the week progressed. On Tuesdays, people reported more sad ($p<.05$) and fewer happy feelings ($p<.05$) than on any other day.

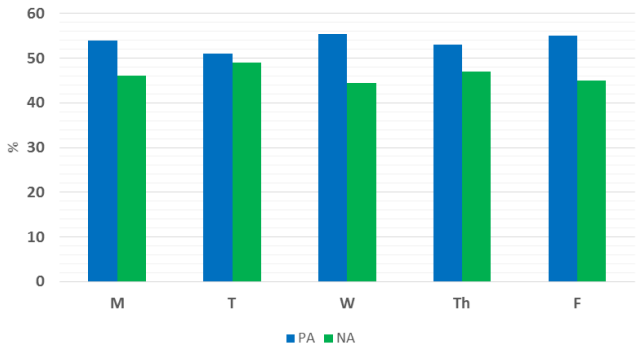

Fig. 6. Proportion of positive and negative emotions reported on different days of the week.

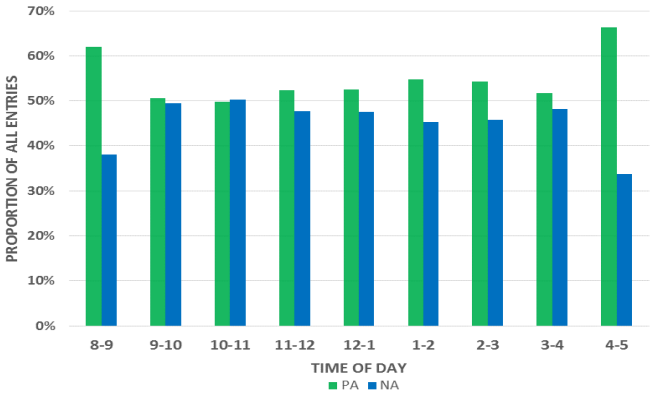

Fig. 7. Hourly changes in the proportion of positive and negative emotions.

On Thursdays, users were more fatigued ($p<.05$), more upset ($p<.10$) and less content ($<.10$) than usual. Finally, Friday emerged as the most exciting day of the week: it had the greatest proportion of happy ($p<.10$) and the lowest proportion of calm entries ($p<.10$) than any other day ($\chi 2\ (40)=54.79$, $p=.06$). The relative frequency of other emotions did not change.

Another interesting question is hourly change in the proportion of specific emotions. For example, are people more alert in the morning, more tired in the afternoon, and equally happy all day long? To analyze hourly trends, we computed the proportion of each emotion in each hour (averaged across all days of the study). Hourly changes in negative emotions are summarized in Fig. 9. We found that the level of *stress* was lowest before 9 am ($p<.05$), then increased, stayed high until about 2 pm, and then dropped again to its morning level ($p<.05$). We also found that *fatigue* peaked between 9 and 10 am ($p<.05$), and not in the afternoon, as one would expect. It is possible that fatigue was used by the participants to indicate a state of low energy and sleepiness, rather than tiredness. In the afternoon, users became more *bored*, and reported these feeling significantly more often after 3 pm ($p<.05$). The relative frequencies of other negative emotions did not vary throughout the day. Hourly changes in positive emotions are summarized in Fig. 10. Overall, positive emotions appeared more stable than negative ones.

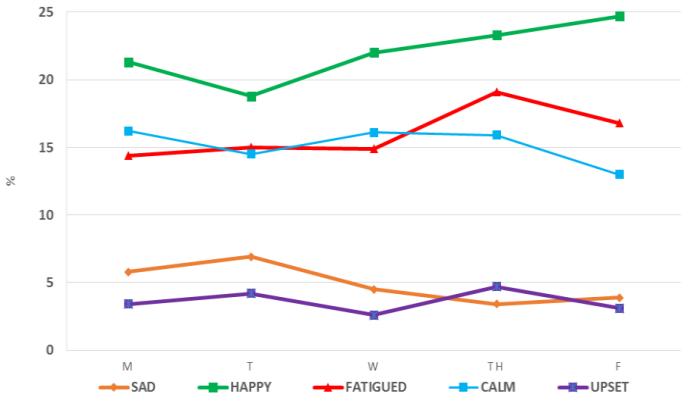

Fig 8. Proportion of each emotion on different days of the week

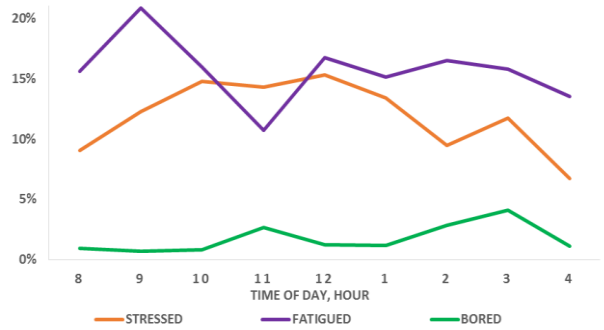

Fig. 9. Hourly changes in the proportion of negative emotions.

The proportion of "happy" and "alert" entries did not change significantly – employees were happy and energetic all day long. The proportion of "content" and "calm" entries peaked in the morning (8-9 am, both at $p<.05$), and then slightly dropped.

The last question we explored concerned effect of the users' job roles on their workplace emotions and emotion self-reports. For example, do accountants feel more stressed than engineers? Do employees in managerial positions use mood-trackers more often than employees in administrative roles? To answer these questions we compared data from tablets installed in different locations of the building. Of course, using a tablet's location as an indicator of users' job role is only an approximation, because all tablets were installed in areas with open access and could be used by anybody, including visitors. However, for the purposes of our analysis this level of precision was acceptable. Four MoodTrackers were placed in coffee areas located close to the offices of various engineering groups (we will label these locations A, B, C, and D), one tablet was placed close to the strategic communication group (E), and the sixth tablet was placed in the area with management and operations offices (F). We found no difference in how often different groups used their mood-tracking devices: the average number of mood self-reports per tablet was the same across all devices ($F(5,102)=1.008$, n.s.). The overall positivity of the reported emotions was also similar across all groups, but with one exception: the tablet installed near group C recorded a significantly greater proportion of positive emotions than other tablets ($\chi 2(5)=18.10$, $p<.001$; Fig. 11).

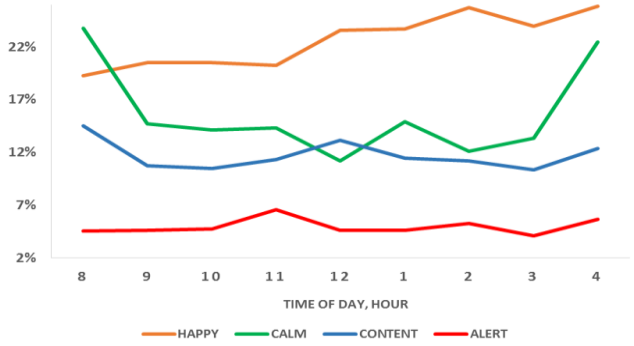

Fig. 10. Hourly changes in the proportion of positive emotions.

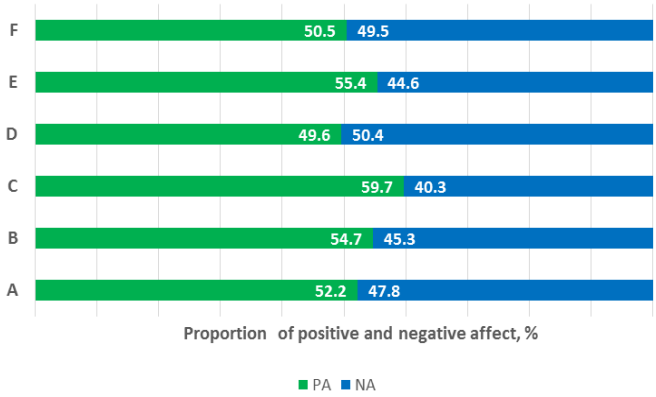

Fig. 11. Emotions recorded in different locations.

The MoodTracker data also allowed us to take a closer look at the distribution of specific emotions within each subject group. We averaged the number each emotion was recorded on each tablet, and then compared relative frequencies of all emotions entered on different tablets. Findings are summarized in Fig. 12, with all significantly different proportions ($p<.05$) marked with an asterisk (*). One interesting observation is that users from the F location (management and administrative) expressed more "unprofessional" emotions (sad, bored) and fewer emotions that are considered appropriate or even desirable in the workplace (stressed, alert). It could means that they really experience different emotions, or that they are simply not self-censoring what they express to the same degree as other users.

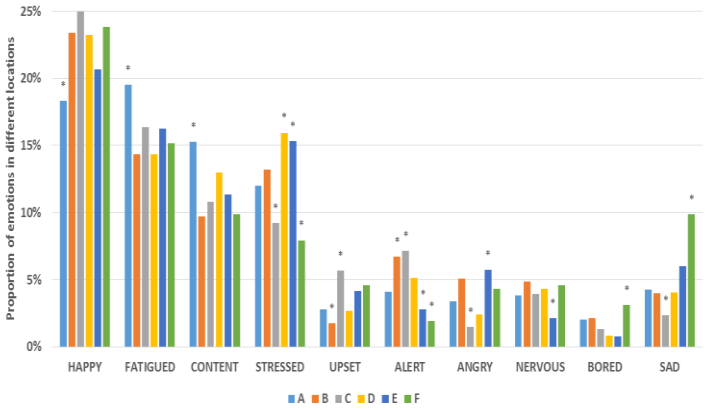

Fig. 12. Relative frequency of all emotions reported in each of the six mood-tracking areas.

VII. Discussion

Findings presented in the previous section illustrate just some of the insights that organizational leaders can obtain by using the MoodTracker – the device we developed to facilitate a continuous monitoring of the collective emotions in large groups in real-time. In situ tests of the first prototype suggest that the device meets most of the practical and methodological requirements for such an ambient technology. Specifically, the MoodTrackers were able to collect affective data in a

workplace setting in real time, with very little effort on the part of the researchers or the users, and in a very unobtrusive manner.

Probably the biggest question with any technology relying on self-reports is users' willingness to participate and provide data. We found evidence that a certain number of employees have serious interest in using the mood-tracking device, both due to its mood-recording and mood-sharing functions. Based on the observational data, we established that approximately 13% of all employees who had a possibility of reporting their emotions (i.e., who were in the temporal and physical proximity to the MoodTracker), did so. We are not aware of any studies that have performed a similar evaluation of such public ambient devices, so we lack data for a valid comparison and evaluation.

The mood-sharing function of the MoodTracker was another reason for employees' high interest in the device and its use. We found that people who came as a part of a group were more likely to both discuss affect statistics with their colleagues, and to report their own moods. Such sharing of emotions provides multiple benefits for the user: the feeling of emotional relief, cognitive coping (e.g., having a chance to think about the emotional event and its consequences), and interpersonal benefits of interaction and comforting [26]. We found that MoodTracker served as a useful platform for sharing emotions, and effectively facilitated interpersonal communication in the workplace.

So, have we solved the problem of the group-level mood tracking? Probably not yet. Although the MoodTracker is a very promising development, we identified several problems that need to be addressed before organization leaders can rely on it. First, our findings were positively biased: employees reported disproportionately more positive than negative emotions. We also found that, despite anonymity of the entries, employees were much more likely to report states that are perceived in the Western cultures as "professional" (e.g., tired, happy), rather than workplace-inappropriate (e.g., bored) [27]. Of course, there remains a high probability that employees in our sample were truly happy and tired, and hardly ever bored. However, there is an equally likely possibility that employees continued to self-censor when reporting their emotions in the public place. One solution to this problem is development of the alternative modes for reporting emotions. Specifically, in addition to the MoodTrackers displayed in the public areas, we plan to install the program on users' desktops to give them an opportunity to share their state privately and anonymously. We believe this will improve validity of the collected data, and increase usage of the device.

Another shortcoming we identified in the current version of the MoodTracker is a lack of the centralized display of the aggregate data.

REFERENCES

[1] Forgas, J. P. (1995). Mood and judgment: the affect infusion model (AIM). *Psychological Bulletin*, *117*(1), 39.

[2] Baas, M., De Dreu, C. K., & Nijstad, B. A. (2008). A meta-analysis of 25 years of mood-creativity research: Hedonic tone, activation, or regulatory focus? *Psychological Bulletin*, *134*(6), 779.

[3] Pillutla, M. M., & Murnighan, J. K. (1996). Unfairness, anger, and spite: Emotional rejections of ultimatum offers. *Organizational Behavior and Human Decision Processes*, *68*(3), 208-224.

[4] Cropanzano, R., James, K., & Konovsky, M. A. (1993). Dispositional affectivity as a predictor of work attitudes and job performance. *Journal of Organizational Behavior*, *14*(6), 595-606.

[5] Barsade, S. G., D. Gibson. (2007). Why does affect matter in organizations? *Acad. Management Perspectives* 36–59.

[6] Brief, A. P., & Weiss, H. M. (2002). Organizational behavior: affect in the workplace. *Annual Review of Psychology*, 53(1), 279-307.

[7] Totterdell, P., Kellett, S., Briner, R. (1998). Evidence of mood linkage in work groups. *The Journal of Personality and Social Psychology*, *74*, 1504-1515.

[8] George, J. (1995). Leader positive mood and group performance: The case of customer service. *Journal of Applied Social Psychology*, 25 (9), 778-794.

[9] Kelly, J. R., & Barsade, S. G. (2001). Mood and emotions in small groups and work teams. *Organizational Behavior & Human Decision Processes*, 86, 99-130.

[10] Duffy, M. K., & Shaw, J. D. (2000). The Salieri syndrome: Consequences of envy in groups. *Small Group Research*, 31, 3-23.

[11] Ekman, P. (1992). An argument for basic emotions. *Cognition and Emotion*, 6 (3), 169–200.

[12] Rules of professional conduct

[13] Masuda, T., P. C. Ellsworth, B. Mesquita, J. Leu, S. Tanida, E. van de Veerdonk. (2008). Placing the face in context: Cultural differences in the perception of facial emotion. *Journal of Personality and Social Psychology*, 94, 365–381.

[14] Sanchez-Burks, J., & Huy, Q. N. (2009). Emotional aperture and strategic change: The accurate recognition of collective emotions. *Organization Science*, *20*(1), 22-34.

[15] Barsade, S. G., D. E. Gibson. 1998. Group emotion: A view from top and bottom. M. A. Neale, E. A. Mannix, eds. *Research on Managing Groups and Teams*. JAI Press, Stamford, CT, 81–102.

[16] Cote, S., & Miners, C. T. (2006). Emotional intelligence, cognitive intelligence, and job performance. *Administrative Science Quarterly*, *51*(1), 1-28.

[17] Mayer, J. Roberts, R., & Barsade, S. (2007). Human Abilities: emotional intelligence. *Annual Review of Psychology*, 507-536.

[18] Golder, S. A., & Macy, M. W. (2011). Diurnal and seasonal mood vary with work, sleep and daylength across diverse cultures. *Science*. 30 Sep 201.

[19] Pennebaker, J. W., Mehl, M. R., & Niederhoffer, K. (2003). Psychological aspects of natural language use: Our words, our selves. *Annual Review of Psychology*, 54, 547-577.

[20] De Choudhury, M., & Counts, S. (2013, February). Understanding affect in the workplace via social media. In *Proceedings of the 2013 conference on Computer supported cooperative work* (pp. 303-316). ACM.

[21] Roseway, A., Lutchyn, Y., Johns, P., Mynatt, E., & Czerwinski, M. (2014). BioCrystal: An Ambient tool for emotion and communication, *International Journal of Mobile Human-Computer Interaction*, in press.

[22] Russell, J. (1980). A Circumplex model of affect. *Journal of Personality and Social Psychology*, 39, 1161-1178.

[23] Izard, C. E. & Malatesta, C. Z. (1987). Perspectives on emotional development: Differential Emotions Theory of early emotional development. In JD Osofsky (ed.), *Handbook of Infant Development* (2nd ed.) (pp. 494-540) New York: J. Wiley.

[24] Beck, R. C. 2004. Motivation Theories and Principles, 5th Ed. Pearson Prentice Hall. New Jersey

[25] Hazlewood, W. R., Stolterman, E., & Connelly, K. (2011). Issues in evaluating ambient displays in the wild: two case studies. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 877-886). ACM.

[26] Pennebaker JW, Zech E, Rimé B. (2001). Disclosing and sharing emotion: psychological, social, and health consequences. In: Stroebe MS, Hansson RO, Stroebe W, Schut H, editors. Handbook of bereavement research: consequences, coping, and care. Washington DC: American Psychological Association; pp. 517–539

[27] Kramer, M. W., & Hess, J. A. (2002). Communication rules for the display of emotions in organizational settings. *Management Communication Quarterly*, *16*(1), 66-80.