A Mobile Application for Time-Use Logging: Toward Participatory Data Collection in Smart Communities

G. Alfieri*, P. Simeone*,
M. Molinara*, V. P. Diaz*, S. Caldaroni†, R. Giammetti†, S. Nisticò†, R. Mosca‡
*Department of Electrical and Information Engineering, University of Cassino and Southern Lazio, Cassino, Italy
European University of Technology EUt+, European Union
Emails: {giuseppe.alfieri, paolo.simeone}@studentmail.unicas.it, {m.molinara}@unicas.it
†Department of Econ@studentmail.unicas.it, omics and Law, University of Cassino and Southern Lazio, Cassino, Italy
European University of Technology EUt+, European Union
Emails: {simone.caldaroni, raffaele.giammetti, s.nistico}@unicas.it
‡Department of Political and Communication Sciences, University of Salerno, Salerno, Italy
Ad Maiora – EVA GROUP srl
Email: rmosca@unisa.it, rmosca@admaiora.com

***Abstract*—We present the design and development of an Android-based mobile application aimed at enabling users to log their daily activities in real-time or retrospectively. The app features a user-friendly interface that supports personalized input frequency and offers a calendar-based view for reviewing or editing past activity logs. Originally conceived for personal productivity, the application also offers significant potential for participatory time-use data collection within smart communities. By capturing fine-grained behavioral data, the system can support urban research studies related to time and budget allocation, well-being, and mobility patterns. Future work includes integrating data analytics modules and launching a pilot deployment in a university setting to assess usage patterns and validate the system's effectiveness in real-world smart city scenarios. This contribution bridges mobile application development and urban informatics, proposing a scalable tool for citizen-centered data acquisition, with applications in behavioral modeling, public policy design, and context-aware urban services.**

***Index Terms*—Time-use analysis, mobile application, smart communities, participatory data collection, urban informatics**

I. Introduction

Understanding how individuals allocate their time is essential for designing effective urban policies and services in smart cities. Traditional time-use surveys often lack granularity or are conducted with limited periodicity, constraining their utility for real-time urban informatics. Recent approaches, such as the Day Reconstruction Method (DRM) [1] and experience sampling, have highlighted the potential of digital tools in capturing more nuanced behavioral data, yet suffer from usability or scalability issues.

Mobile applications for time-use logging have gained attention for their potential to replace traditional paper-based diaries with real-time or retrospective data entry on smartphones. The "Life in a Day" app [2] and Smart Diary framework [3] exemplify such tools, demonstrating usability, user preference, and the ability to collect granular behavioral data.

Within smart cities, citizen-centered data collection is often implemented via participatory sensing and mobile crowdsensing [4]. These paradigms mobilize citizens as data providers, contributing to environmental monitoring [5], infrastructure reporting, and mobility pattern analysis. While promising, reviews [5] highlight the limited maturity and lack of long-term validation in current deployments.

Pilot studies underscore both opportunities and challenges in mobile sensing adoption. Ainsworth et al. [2] report high usability and acceptability in a health monitoring context. In urban deployments, apps have supported data collection on mobility and local concerns [6]. However, user engagement remains a key issue, with participation typically dropping after the initial phase. Factors such as user burden, motivation, and perceived value influence sustained involvement [7]. Techniques such as gamification, feedback loops, and reputation-based data validation have been proposed to address these challenges [7].

This paper introduces *Chronogram*, an Android-based mobile application designed to log daily activities in real-time or retrospectively. Initially conceived for individual productivity tracking, the system is now positioned as a tool for participatory data collection within smart communities. Chronogram introduces a flexible, dual-purpose mobile platform for both personal time-use tracking and participatory data collection within smart communities. Unlike traditional studies relying on fixed-time diaries or one-off surveys, it enables real-time or retrospective logging with a user-friendly interface and customizable input frequency. By bridging mobile interaction design, behavioral economics, and urban data platforms, *Chronogram* enables fine-grained, citizen-generated time-use data to support planning and service personalization in smart city environments. One key element of Chronogram is the inclusion of real-time data collection on the costs of goods and services, along with the respondent's perceived well-being during the activities

they engage in [8] as part of daily urban life. The option to conduct a post-survey interview enables the collection of personal income data, thereby expanding the scope of data gathering and informing economic policy strategies related to income distribution in urban areas.

II. Methods

The development of *Chronogram* followed an Agile methodology. The application architecture adopts a client-server model with an Vue-based frontend, and a backend implemented in Java (Struts2) and MySQL, deployed on Tomcat.

The app interface includes two primary functionalities: **Real-time logging:** Users can add activities during the day in hourly time slots via a scrollable interface; **Retrospective logging:** A calendar view allows the review and editing of past days.

Each activity entry records: Type and duration, Category (e.g., work, personal care, leisure), Instrumentality (Instrumental or Final), Recurrence (Routinary or Exceptional), Location, Cost (if any), Level of pleasantness (scale -3 to +3), Parallel activities.

The app integrates guidance to minimize user burden, including predefined options, tooltips, and progress validation.

III. Results

The initial implementation phase involved internal pilot testing with university students, focusing on usability and data completeness. Key metrics collected over a two-week period included: Number of unique activities logged per day, Average completion time for a full-day diary, Most frequent activity categories, leisure), meals.

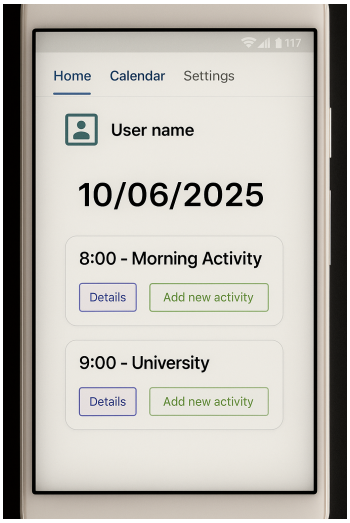

Fig. 1. UI of the home page

Qualitative feedback highlighted the intuitiveness of the interface and the value of reviewing one's own behavioral patterns. Users also appreciated the integration of economic context and parallel activity logging, which increased perceived data relevance.

We also benchmarked *Chronogram* against existing platforms like *MOTUS* and *mytimeuse.com*. While these offer more complex research-grade infrastructures, *Chronogram* provides enhanced flexibility for in-app customization, immediate logging, and contextual economic tagging in a mobile-native form.

IV. Discussion and Conclusion

Chronogram demonstrates how mobile applications can serve as participatory tools for time-use data acquisition in smart communities. Compared to survey-based or web diary platforms, its mobile-first approach supports more organic and contextual data capture. This is especially valuable in urban scenarios where mobility, social interaction, and resource usage are tightly interwoven.

The ongoing development includes integrating weather data, expanding emotion tracking, and enabling group-level analysis for community well-being studies.

Future work will focus on broader deployments, such as within university campuses or local municipalities, to validate its effectiveness in guiding policy interventions, urban mobility planning, and targeted public services.

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