Playful Laundry: A Gamified Laundry Booking System

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ABSTRACT
This paper describes the approach of gamifying traditional reservation systems for shared facilities in order to improve user experience and usage effectiveness. In particular, we apply the solution to enhance dormitory laundry room usage and present Playful Laundry which is a gamified laundry booking system. Similar to any reservation systems, Playful Laundry allows users to reserve washing machines and manage their bookings on mobile phone. Moreover, the system also sends reminders of upcoming booking and finished jobs as well as provides a real time status observation and usage statistics of the machines. Finally, by using game elements: levels, points and leader-board, the systems brings users into playful experiments and changes their behaviors toward efficiently using of the machines.

ACM Classification Keywords
H.5.2. User Interfaces: Theory and Methods

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Gamification; Laundry Booking System; Reservation System

INTRODUCTION
Reservation systems are software systems that store and retrieve information about services or facilities and conduct transactions for booking them [8]. These systems are most commonly used by airlines or travel agencies to book flight tickets, hotel rooms and lodging facilities. In recent years, there has been a growing trend in sharing ownership of cars, bikes or some other infrequently used assets as a way to avoid paying for such rarely used facilities. In fact, shared-use vehicle systems [1, 5] has attracted a great deal of interest due to their benefits to the users and environment. Similar to reservation systems, these shared asset management systems not only keep track of resources status and people who are using them but also resolve common problems related to scheduling such as: double booking or over booking. However, using shared assets involves more than just simply observation and reservation; it is enmeshed in daily activities of users; which constitutes a fluctuation in demand of a particular service or asset. For example, there would be an enormous demand on hotel rooms and airline tickets in holiday seasons; shared vehicles only shows their effectiveness before or after working hours. Therefore, the facilities are not used at their highest capacities while the waiting lists are lengthened during peak hours. To keep the number of demands steady, we propose an approach which gamifies traditional reservation systems.

Gamification, application of game elements and game principles into non-game contexts to support user engagement [2, 6], has been proved to improve service use such as increasing social interaction or quality and productivity of the actions [6]. In this paper, we aim at understanding how gamification might enhance user experience and change their behaviors in using shared facilities. For evaluation, we present the design and deployment of Playful Laundry which is a gamified version of the laundry booking system. Findings from interviewing the students who are currently using a shared laundry room in dormitory offer evidence that our application has been attracting much interest of the user and promising to adjust their laundry habits.

RELATED WORK
The idea of a system that affords reservation, observation and notification is not new. It has been widely used in transportation, hotel or even entertainment industries for years. Nowadays, every online reservation systems allow users to reserve services in advance, manage bookings and remind them whenever the time coming.

There are also some works putting effort on flow optimization such as introducing the concept of "Reward Pool" which provides its users with incentives to improve its utilization [9]. For example, today most travel reservation systems award money to the users as an incentive for reserving unpopular time slots. In [4], the authors proposed using priority criteria and access threshold in order to remove waiting list of surgical and medical procedures. Edara *et al.* presented Highway Space Inventory Control System which is a booking system for highway trip that determine whether to accept or reject a reservation based on a pre-defined demand in order to optimize the highway allocations for different traffic scenarios [3].

All these solutions are only adaptable for a particular situation and could not be reused at all. In this project, we extend the idea of reservation system toward gamification in order to not only improve user experience but also address the optimization problem.

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DOI string from ACM form confirmation

GAMIFICATION AND GAME ELEMENTS

Gamification has been defined as the use of *game-design elements* for *non-game context* to motivate and improve user activity and retention [2, 6]. Following the success of the location-based services *Foursquare*, the idea of gamification has become a trending topic in interaction design and digital marketing [2] in recent years. By using game elements as motivational affordances, gamified applications have showed their effectiveness in producing desired *psychological* (e.g., user experience, engagement, fun, etc.) and *behavioral outcomes* (e.g, participation, performance, productivity, etc.) [2]. Currently, there is no specified collection of game elements which could be used in gamified systems; it depends on the intentional purpose and the non-game context. Some commonly used elements are: points, level and progression, awards, goal/challenge, badges and leader-board.

There is no doubt that gamification provides effective support for various type of industries. One typical example of gamification is *Nike+*, a mobile application developed by *Nike*, which successfully motivates people to run. By adding new elements to running, Nike has made running become more fun. With Nike+, users can connect, challenge, cheer and motivate their friends or running buddies around the world. *Xbox Live* is another success example which uses scores, avatars and challenges to involve users into new games. With Xbox Live, *Microsoft* has completely changed console gaming experience for everyone.

With the success stories of gamification in motivating users, we hypothesize that this concept is also beneficial to improving aforementioned situation in current reservation systems.

LAUNDRY PRACTICES

Laundry practices are not just washing and drying clothes; they are effected by the ordering of our daily routines [7] and other occasional factors external to laundry itself such as running out of clothes. In order to understand laundry habits and typical use scenarios of shared washing machine, we conducted user surveys and a pilot workshop involving students in the dormitory to collect information about their experiences of using shared laundry room and their thinking toward an ideal management system.

It is not very surprising that the students have issues when using the communal laundry room which has a limited number of washing machines. Firstly, to do the laundry, the students periodically go to the laundry room to check for available machines. During weekend, it could take them hours waiting for their turns. Secondly, the wash times are variable and unpredictable because washing machines automatically adjust their wash cycle duration according to factors such as: clothes weight, water temperature or pressure, etc. Therefore, students also have to check for the finished jobs. Sometimes, forgetting to pick up the clothes could get them left out by other student. However, these situations only happen commonly during peak hours when the vast majority of students come and do their laundry at the same time whereas the washing machines are being left unused at other times; resulting in an inefficient usage of the machines.

With those aforementioned issues of an example of "the tragedy of the commons" at the dormitory, the participants in the workshop also come up with some requirements for a management system. Particularly, they are looking forward to a system that allows them to reserve laundry time-slot in advance and remind them for upcoming booking or finished job. Some students do not always remember to book a time-slot, they want the system to allow them to reserve the machine at the laundry room or provide information about available machine right away without having to go to the laundry room.

OUR APPROACH

The Game Rules

Based on the information collected from users and *envisioning*, we design and prototype Playful Laundry, a laundry booking system which affords:

- Reserving and managing time-slot on mobile phone or at the laundry room.
- Notifying the users for upcoming bookings, finished jobs.
- Real-time status observation of the machines.
- Display of statistics about usage history of the machines.

Additionally, avatars, points, level/progress, leader board are added in order to make doing laundry more dramatic.

Avatar is a graphical representation of a user. Users are not required to add an avatar image. If they do, their avatars could appear along with their rankings on the leader board.

Leader board shows user names, avatar, levels and their ranks among other users. Leader board ranks users based on their current levels and progressions. By default, the system shows only top twenty uses on the leader board.

Level is used for ranking users. The users need to earn some points in order to get to next level. They are also awarded points for level up. The amount of required points keeps increasing with the level number. In exchange of that, they also get bigger awards. In addition, there is also limitation on the number of reservations (per week) that users allows to make. This number would be increased when the users get to higher levels. Progression signifies the percentage of points user already get over the required points they need for getting to next level. Whenever some users are at the same level, progressions are used to determine their ranks on the leader board.

Typically, a laundry booking system allows users to reserve a washing machine for a period of time. They also have to pay for that reservation by cash. With Playful Laundry, users can also make reservation with their points. However, earning some points is not easy whereas it costs much more points, compared with a smaller amount of money, to book a machine. The users can earn points by:

- Making reservations. The users earn some points for each time they book a machine. However, the amounts of awarded points are not the same for every time slot. Booking in unpopular time slots would get them more points.

Every week, the system calculates statistics about the bookings made in that weeks by hours and days; based on these numbers, it would determine and assign points to each time slot on the principle of balancing the amounts of bookings in each time slot.

- Level up. The users would get some points when getting to a new level. The higher level, the more awarded points.
- Being in top twenty of the leader board. Every week, the system would awards some points to users whose name are showed on the leader board. The higher rank, the bigger award.
- Reporting. By reserving a machine, the users are responsible for finishing their job within a period of time. However, if they forget to pick up their clothes, other users could report them as being late. They would lose some points for the person who report them.

Prototype

Based on the presented idea, we design and present the prototype which consists of three components (see Figure 1):

- The server centrally manages all users information, bookings and machines status.
- Each washing machine has a monitoring device which displays current states of the machine and communicate with server.
- Playful Laundry is the laundry booking application on mobile phone.

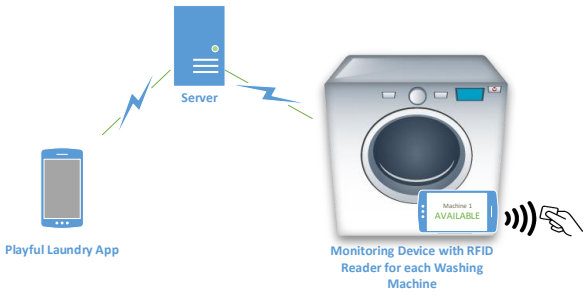


Figure 1: Three components of the booking system.

Monitoring Device

Each monitoring device has a RFID reader and a screen which displays interactive instruction and information of the machine such as: machine id, remaining time of current job, current state of washing machine (*AVAILABE* - there is still enough time before the next reservation begins, *USED IN A MOMENT* - next reservation will begin shortly, *RESERVED* - the machine was already booked at that moment, *IN USE* - machine is running, *FINISHED* - washing has just finished), etc. For prototyping monitoring device, we use an android phone as a display and an arduino uno board with RFID shield (see Figure 2). To activate a machine, users could either scan their

Figure 2: The prototype of monitoring device.

RFID cards or enter PIN number. If the users already reserved the current time slot, monitoring device would instruct them to start the machine; otherwise they have go through booking process right on the monitoring device before using the machine.

When the machine is *IN USE* or *FINISHED* state, the *booking id* of current session would be showed on the screen. Figure 3 shows the screenshot of the display when the machine is *IN USE*. This id disappears once the users take their clothes out of the machine. Therefore, if the users are being late, other users could use this *booking id* and the *machine id* for reporting.

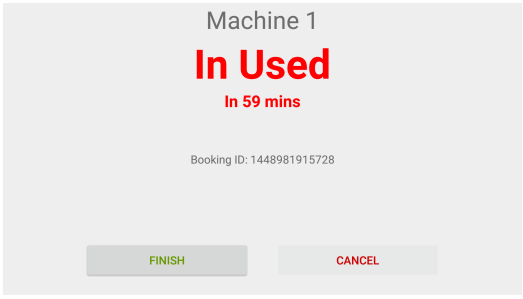


Figure 3: Monitoring display when the machine is running.

Playful Laundry Application

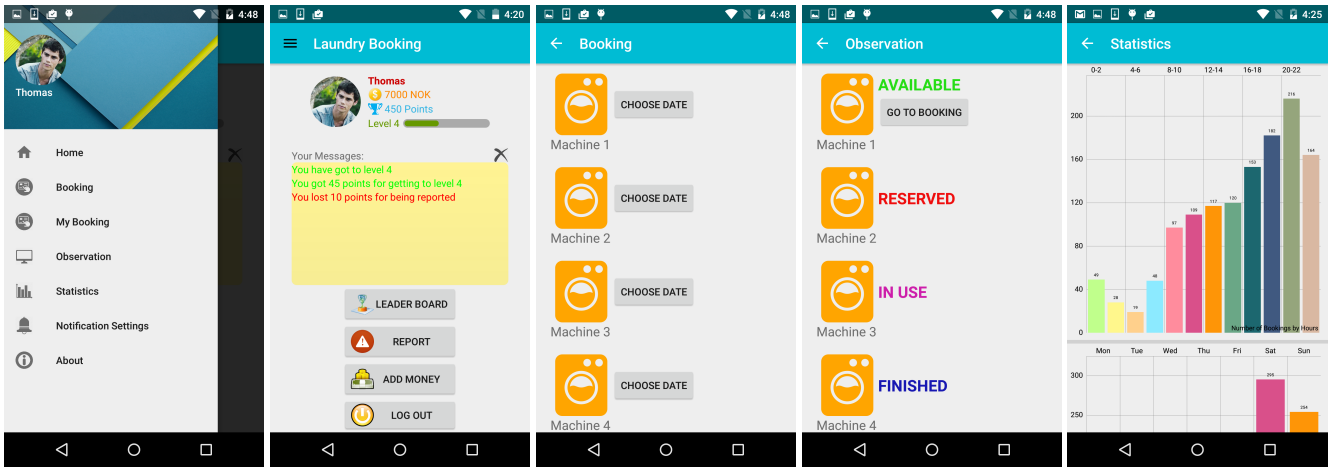
Playful Laundry is an android application which allows users to reserve a washing machine, manage booking, observe the current states of the machines, etc. Figure 4a shows the menu of the application.

EVALUATION

Evaluation

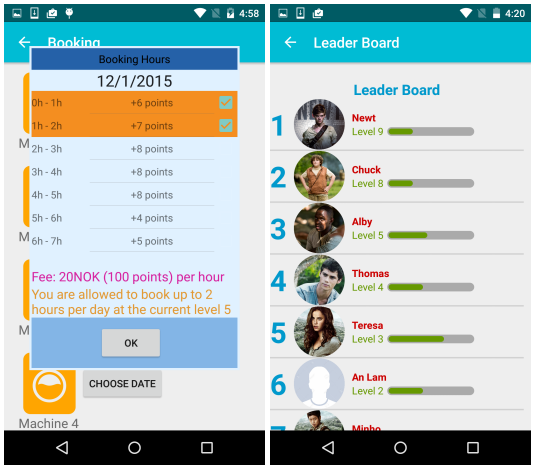
CONCLUSION AND FUTURE WORK

Conclusion



(a) Main menu (b) Home (c) Booking (d) Observation (e) Statistics

Figure 4: User interface of Playful Laundry.



(a) Time slots and award points (b) Leader Board

Figure 5: Time slots and Leader board.

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