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 shown 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 users 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 shown 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.

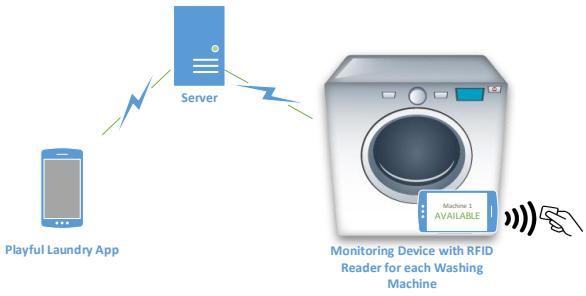


Figure 1: Three components of the booking system.

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 shown 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.

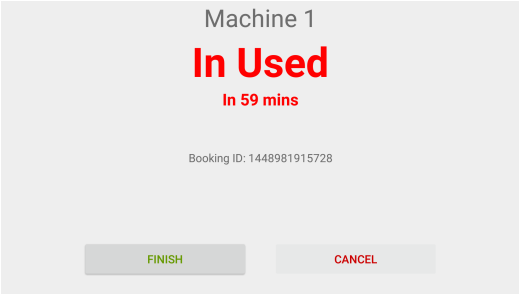
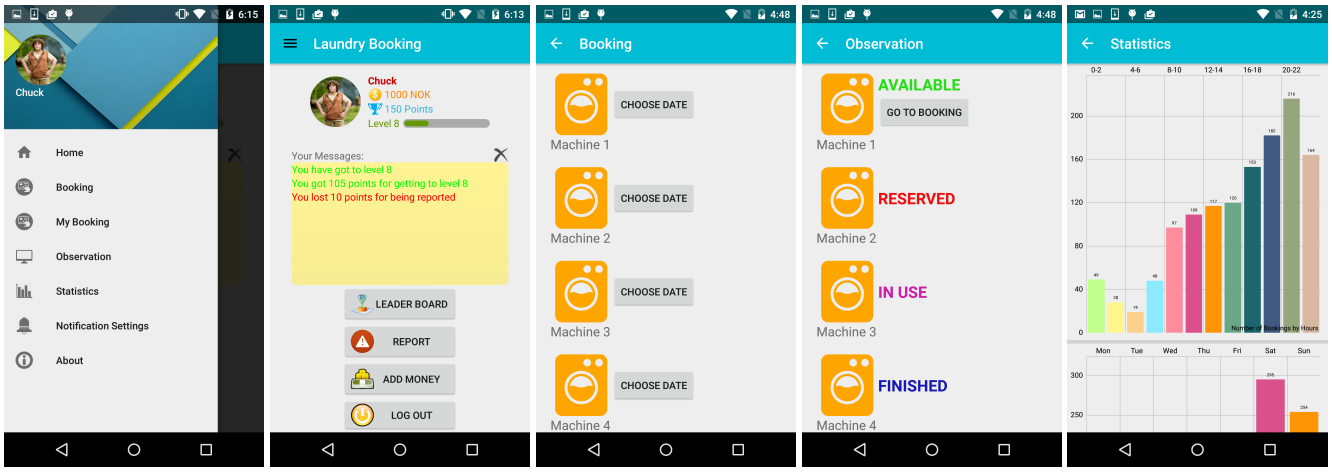


Figure 3: Monitoring display when the machine is running.

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.

The *Booking* tab (see Figure 4c) allows users to make a reservation for a specific time-slot. There is limitation on the number of time-slots user could book in a week. This number would be increased when user get to higher level. Figure 5a shows the booking interface with time-slots. Users would be awarded points for each time-slot they reserve. The amounts of awards depend on how popular that time-slot is.



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

Figure 4: User interface of Playful Laundry.

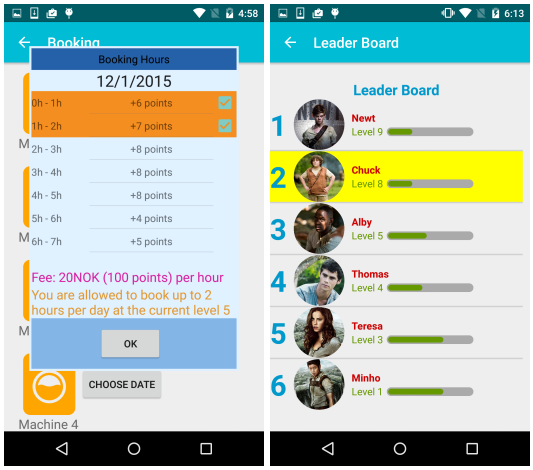
In *My Booking* tab, users could find all their upcoming bookings. They could also cancel a booking in this tab.

Observation (see Figure 4d) shows the current states of all washing machine. Users could use this function to check for available machines at that moment and use it right away without booking in advance.

There are two bar charts displayed in *Statistics* tab (see Figure 4e). The first one illustrates numbers of bookings in previous week by hours while the second one represents these numbers by days. Users could use these statistics to plan their "laundry strategy" of the week.

Notification allows users to set reminder. The application always use in-app notification to remind users for upcoming bookings or finished jobs. In addition, they could choose to set reminder by email or SMS message.

The *Home* interface (see Figure 4b) displays all information about the user. This is where gamification idea is implemented. In this tab, users could find his avatars, names, balance and points, levels and progression as well as messages about their activities. There are also buttons allow them to access leader board (see Figure 5b), report a person or add money to account.



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

Figure 5: Time-slots and Leader board.

EVALUATION

For evaluation, we conducted individual interviews with 5 participants (aged 23-26) who are current sharing a laundry room in dormitory and familiar with android applications. In the beginning, we introduced to the participants about a new laundry booking systems and wanted to get feedback from them. They had no idea about gamification and the problem we are trying to solve by applying it. They then were asked to try using all the function of Playful Laundry and say whatever came into their mind (*Think aloud technique*). The purpose of this step was to test usability and help the participants get used to the application. After that we explained in detail each function of the application and go through the questionnaires aiming at understanding whether Playful Laundry interests them and get them change their laundry habits. For each question, the participant had to give a score (from 1 - totally disagree to 8 - totally agree) and explain their thinking. Table 1 showed the questions and average scores from the participants.

Usability (Questions 1 - 4)

All participants found it straightforward to reserve and manage their bookings because they were already familiar with other reservation systems and the interfaces are also intuitive enough to walk them through booking steps. However, they were confused with other additional elements such as points and reporting. They did not understand why they need points or what kind of reporting the application provides. This explains why the application got 5.5 in Question 1.

No.	*Question*	*Avg. score (1 - 8)*
1	This application is easy to use.	5.5
2	This application helps tackle problems you're experiencing with doing laundry.	6
3	This application helps you save time.	6.5
4	There are some missing features or information in this application that will help you with doing laundry.	2.75
5	You find this application interesting and want to use this.	6.75
6	The awards/penalties parts are fun/interesting to use.	7
7	You like the Report functionality.	5
8	You are interested in earning points and advancing your ranking with this application.	7
9	You are willing to do your laundry in non-peak hours because you'll gain more points.	7
10	This application will change your habits of doing laundry in the long run.	6.75

Table 1: Questions and average score from the participants.

Almost participants are excited about *Observation* and *Statistics* ideas. They thought these functions are very informative and helpful in saving time and planing for doing laundry. They all thought that this application is what they really want at the moment.

User Engagement (Questions 5 - 8)

All of the participants found this application really fun to use. One participate reflected on the usefulness of the service: *"This application is fun and fair. It not only encourages users to do laundry but also punishes them if they use the machines for too long"*. Another one says:*"I really like this application because of its purpose of balancing the number of demands of washing machine users. It is the best feature of this application."*.

Most of them felt interested in awards/penalties. They thought it is reasonable to apply penalties on overuse. However, there are different opinions on reporting. While some participants would be willing to report other user even if they would not awarded points, the others disagreed. One participant suggested changes: *"I don't feel good when reporting someone for points. I'd rather be reported by a machine. I'll feel uncomfortable knowing someone has just reported me."*

All participants were completely sure to involve themselves in earning points and advancing level because of their benefits. Furthermore, some participants believed the application could also have social impact with leader board and reporting. One said: *"If my friends do care about their ranks on leader board, I also want to join them. It would be much more fun if the system allows me to share status about my progress such as: 'Just got 500 points for getting to level 5' or 'Being reported again!' "*. Another one also suggested *"Leader board doesn't have much influence on me. I really don't care if I get to higher or lower rank. I would only worry if they publish information about persons who usually got reported."*

Behavior Change (Questions 9 - 10)

All of the participants thought they would obviously change their behaviors when using this application because of the benefits it brings to them. Firstly, earning points helps them save money when using the machine. Furthermore, the application brings them into a playful and competitive environment. One participant shared: *"This is absolutely a fair competition. My schedule is very flexible. I will surly change my laundry habit in exchange of saving money and having fun"*.

CONCLUSION

We have presented Playful Laundry - a laundry booking system which uses gamification as a service layer of reward and penalty system with points, levels and leader board. Apart from typical functions of a reservation system such as making and managing bookings and setting reminders, Playful Laundry also provides users with informative features such as real-time state observation and usage statistics of the machine. Furthermore, by using game elements as motivational affordance, the system helps improve user experience and engagement. Findings from interviews reveal that the system potentially engage users into using the application and doing laundry with fun and exciting experience. Additionally, the interviewees also supposed that with this application, they would change their laundry habits in long run.

Using incentive for motivating users is not a new idea. However, as far as we know, there is no work actually applies game elements such as levels or leader board into booking systems. We believe our presented idea could be extended to any reservation systems especially for shared facilities in order to engage users into using facilities as well as gain a uniform distribution of the requests.

REFERENCES

1. Matthew Barth and Susan Shaheen. 2002. Shared-use vehicle systems: Framework for classifying carsharing, station cars, and combined approaches. *Transportation Research Record: Journal of the Transportation Research Board* 1791 (2002), 105–112.
2. Sebastian Deterding, Dan Dixon, Rilla Khaled, and Lennart Nacke. 2011. From game design elements to gamefulness: defining gamification. In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*. ACM, 9–15.
3. Praveen Edara and Dušan Teodorović. 2008. Model of an advance-booking system for highway trips. *Transportation Research Part C: Emerging Technologies* 16, 1 (2008), 36–53.

4. Robin Gauld and Sarah Derrett. 2000. Solving the surgical waiting list problem? New Zealand's 'booking system'. *The International journal of health planning and management* 15, 4 (2000), 259–272.
5. NextBike Gmbh. 2015. NextBike. (2015). http://www.nextbike.net/
6. Juho Hamari, Jonna Koivisto, and Harri Sarsa. 2014. Does gamification work?–a literature review of empirical studies on gamification. In *System Sciences (HICSS), 2014 47th Hawaii International Conference on*. IEEE, 3025–3034.
7. Elizabeth Shove and others. 2010. Beyond the ABC: climate change policy and theories of social change. *Environment and planning. A* 42, 6 (2010), 1273.
8. Wikipedia. 2015. Computer Reservations System. (2015). https://en.wikipedia.org/wiki/Computer_reservations_system
9. Henri MA Winand and Paul J Harris. 2006. Methods and systems for optimizing flow. (June 29 2006). US Patent App. 12/306,840.