

UDent: Universiti Teknologi Malaysia Dental Clinic Appointment System

Aina Adilah Binti Ramli¹, Raja Zahilah²

Faculty of Computing, University Teknologi Malaysia, Johor, Malaysia.

¹ainaadilahrz@gmail.com, ²zahilah@utm.my

Abstract—UDent is a web based system developed to help in managing the appointment at the UTM Dental Clinic. This system was developed for UTM Dental Clinic, UTM. The problem faced by current appointment system is the appointment process which created manually. This condition gives limitation to patients where patient have disability to make their own appointments. On top of that, patients are required to come for first check-up before any appointment is set-up for further treatment if required. Therefore, to solve the problem, a web based system had been proposed. The UDent is an appointment system able to assist UTM Dental Clinic in managing patient appointments, gives information about UTM Dental Clinic and provides the appointment notifications to patients and doctors. Prototype model will be used as a methodology in the development process of this system. During the development of this appointment system, there are some software and tools used to help in smoothing the process of development of web UDent. Programming languages such as C# is used during the development process. ASP.net technology will be used to help launch the process of managing the database.

Keywords—*UTM; Dental Clinic; Appointment System*

1 Introduction

UTM Dental Clinic caters for patients to get dental treatment or examination on Sunday to Thursday during the academic week. In addition, UTM Dental Clinic is open every Tuesday at evening for UTM staff who have an appointment dental treatment that has been prescribed by a dentist. For UTM staff or dependents of and student dependent who need a dental examination and treatment without an appointment, UTM Dental Clinic is open for them every Friday starting at 8.30am (1).

Currently, UTM Dental Clinic serves UTM students, UTM staff and their dependents. In the meantime, UTM Dental Clinic are also open to out-patient. Normally, for those who need to treatment they are required to come straight to UTM Dental Clinic and queue for the treatment session. They first need to go for registration first and wait for their turn. They does not have any other option. Patients are not allowed to set-up for appointment beforehand. As the appointment will only be given and arranged by the dental officer at the clinic.

The current manual method giving problems to clinic's staff, doctors and patients. The result from using current manual method is the long queuing time for the patients. As for the patients, they need to follow the Dental Clinic procedure for the first dental treatment. Even after they are given the follow-up appointment date, they are not able to choose their

own preferred time. The current manual method also insufficient for the management team as the doctors and staff facing problems with managing patient appointment schedule.

Apart from that, a web appointment system had been proposed in order to ease the appointment management process. The web system purposed by developer is UTM Dental Clinic Appointment System (UDent). The developer decided to come up with this idea after looking and counting the UTM Dental Clinic constraints.

UDent is the website Dental Clinic Appointment System that has been developed for UTM Dental Clinic. UDent is a system that will be developed in a web environment that will be a good system for the patient in the Dental Clinic UTM to book an appointment slot with the dentist at UTM Dental Clinic. This web system is specifically developed for UTM Dental Clinic.

This web system will also be used by the UTM Dental management team to arrange and manage the appointment. The future users for this system will be system admin, clinic admin(management team), doctors and patients.

2 Background

2.1 The Importance of UDent

The importance of developing UDent web-based system is to facilitate all those who involve in the appointment session at UTM Dental Clinic. UDent allows users to make an appointment for their dental treatment according to their preferred time. UDent system will provide many benefits to anyone who wants to get treatment from UTM Dental Clinic. In addition, UDent system will also provide patients with all the information from the clinic and treatment provided in the UTM Dental Clinic.

Meanwhile, for clinic admin this system will help the appointment management process. Besides arranging the appointment, this systems will be a platform to send patients the information and notifications about the appointment and also the treatment provided at the clinic.

2.2 Objective of UDent Development

The objective of developing UDent system are:

1. To develop a web-based appointment system for UTM Dental Clinic patients to make appointment for their treatment and dental examination.
2. To provide a website for users to manage their dental appointment with UTM Dental Clinic and receive notification of their appointment session.
3. To evaluate the effectiveness of the UDent web system through survey in the testing phase.

2.3 The existing appointment system

The existing appointment system have their own features which are used to attract and engage with their respective users. The result from research on the current existing system are show in the TABLE 1 below.

TABLE 1. Overview Comparison with other existing system ^{Key}

System Name	UKM Health Center Appointment System	NHGP Appointment System	SingHealth Appointment System	UDent
Treatment List				
Treatment Price List				
Appointment Booking				
Appointment Management				
Appointment Notification				
Clinic Information				

2.4 The features of UDent

UDent system is equipped with the notification system for every appointment made. This is a notification system works to help users get notification about their appointment confirmation status. This can prevent the user forget about appointments they have made. Notification will be provided via e-mail that had been provided by the users.

UDent also comes with the calendar that have the information of date that can be selected by patients.

3 Design and implementation

UDent web system interacts with four actors which are system admin, clinic admin, doctor and patient.

3.1 Actors in UDent

Patient in this system is the person who have function to make appointment through the UDent system. The patient also able to register, login and receive notification for their appointment. All appointments made by patient will first received by the clinic and approved by the clinic to confirm the date and time of their appointment.

Doctor in this system is the person who have the function to access their own appointment that have been confirmed and receive notification for their own appointment.

Clinic admin is a person who have function to approve, make appointment on behalf of the patients and update the information on the system. Clinic admin play the largest role in order to make decision about the appointment for the doctors and patients.

System admin is the person who have function to update, edit and delete the information of the system that involve all of the users who use the system.

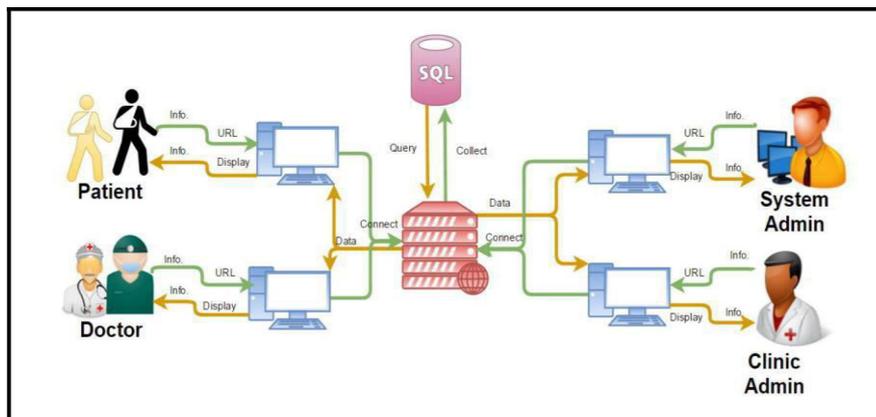


Figure 12. UDent System Architecture

3.2 Technology Use in UDent Development

To ensure the successful of UDent system development there are some technologies and tools that used.

The software used in the development process are such as Microsoft Word 2016 and Microsoft Visual Studio 2015. This software used in the development process and documentation process.

The language use in developing UDent system is C#, CSS and HTML which involve in creating a user-friendly web system (4).

ASP.net is the server-side web application framework used to help in building a dynamic web sites, web applications and web services (5).

3.3 UDent Design

All users interact with the system via any browsers to access to the system, all actors must input data which will be analyzed before giving the exact users their specific functions that can be access and use by the specific actors. The UDent system architecture is shown as in Figure 1.

Different actors have different role. The role of each actor will be authenticated and identified when users input their login information. Doctors need to login to view the appointment and check their appointment schedule. Patient required to login to check their appointment status and make appointment. Admins are required to login to approve users, patient, edit, update and delete information in the web site.

As the admin for clinic will be more than one and they can change the information in the system, it is important to check their login session in order to ensure there is one who will be accountable for any changes done to the system. Their login session and their last update should be recorded in the system.

In order to make the appointment efficiently works and to avoid redundancy. The system will set that only one appointment can be made in a day. Every appointment has it specific id and required to be approved by the clinic admin.

UDent use Microsoft Sql Server in order to keep all the data to database. Database of UDent consist of a few table as the system developed in Bahasa Malaysia so all the tables are named in Bahasa Malaysia. The table in the database are pengguna (user), pesakit (patient), temujanji (appointment), fakulti (faculty), kategori (category).

By using UDent, users can make their own appointment and receive notification. This is the most crucial function of UDent. All the appointment created will be kept into UDent database. All of the data will be secured and encrypted to avoid any attack in the middle of data transferring process.

Furthermore, Udent will allow out-patient to use the system for registration and also make their own appointment. Basically, Udent is not created for UTM internal use only as a non-UTM patient also may use the system. Patients may also check for any empty appointment slot that they want to book for their own appointment. The system use Bahasa Malaysia language all throughout the development of the system. Figures below show the sample of interface for Udent system.



Figure 13. The patient appointment interface.



Figure 14. About us page

As shown in figure 2, the patient may view the empty slot on the calendar and book their appointment on their preferred date and time.

3.4 Udent Security Implementation

In the process of implementing Udent, there are a few security implementations that had been done. The objective of implementing security in the system is to ensure the data sent to the system are secured. As the data are also keyed in by users, the data need to be standardized as it was entered to the system.

The first security implementation is the system have Required Field Validator phase. As user key in data for registration or to add users, there are a few field that must be fill by users as it is a compulsory information for registration. The prompt message will be display if the required field are empty.

After checking for required field validator all of the data keyed in by users are then need to pass the regular expression validator. The data will be checked it is either it fulfills the database requirement or not. If the data entered are not synchronize, it will prompt until the data entered as per required.

The last one is tracing the log in session made by users. This part only can be seen by all of the users. In order to ensure data integrity, the system pursue this kind of security as if anything changes made in the system will be traced easily.

4 Conclusion and future work

In conclusion, U Dent is an online appointment system. This web-based system is created in order to replace the current manual appointment card use by UTM Dental Clinic. The current dental appointment is set by doctor after the first treatment made by patient.

The system provides features such as giving notification for patient appointment through email. The benefits of the system are to enable patient to create their own appointment and this will reduce the waiting time for patient at the clinic that usually have many people.

The system development process is still in progress and user assessment test will be done after the system is done.

The system also provides users with UTM Dental Clinic maps that allow users to view the map in case the user is lost. Users may also check the treatment pricing so that patient may roughly know the amount of expected pricing beside viewing the list of services provided by UTM Dental Clinic as shown in figure 4.

After the end of this project, it is expected to be use by UTM Dental Clinic in order to improve and help managing their patient's appointment.

This project was supervised by Dr. Raja Zahilah. I would like to thank her for the guidance and suggestion throughout the development and implementation process.



The screenshot shows the 'Service (Servis)' page of the UTM Dental Clinic Appointment System. It features a table with the following columns: No., Nama Rawatan (Treatment Name), Masa Menerima (Reception Time), Masa Anjakan (Appointment Time), Tarif dan Harga (Price and Rate), and Pakej Law dan Harga Sisa (Package Law and Remaining Price). The table lists various dental services such as 'Perawatan dan Rawatan Gigitan' (Dental Treatment and Care), 'Rawatan dan Perawatan' (Treatment and Care), 'Perawatan Gigi (General Dental)', 'Rawatan Gigi (General Dental)', and 'Rawatan Gigi (General Dental)'. The prices range from RM 10.00 to RM 100.00.

No.	Nama Rawatan	Masa Menerima	Masa Anjakan	Tarif dan Harga	Pakej Law dan Harga Sisa
1	Perawatan dan Rawatan Gigitan	10:00 - 12:00	10:00 - 12:00	10.00 - 12.00	10.00 - 12.00
2	Rawatan dan Perawatan	13:00 - 15:00	13:00 - 15:00	13.00 - 15.00	13.00 - 15.00
3	Perawatan Gigi (General Dental)	16:00 - 18:00	16:00 - 18:00	16.00 - 18.00	16.00 - 18.00
4	Rawatan Gigi (General Dental)	19:00 - 21:00	19:00 - 21:00	19.00 - 21.00	19.00 - 21.00
5	Rawatan Gigi (General Dental)	22:00 - 24:00	22:00 - 24:00	22.00 - 24.00	22.00 - 24.00
6	Rawatan Gigi (General Dental)	25:00 - 27:00	25:00 - 27:00	25.00 - 27.00	25.00 - 27.00
7	Rawatan Gigi (General Dental)	28:00 - 30:00	28:00 - 30:00	28.00 - 30.00	28.00 - 30.00
8	Rawatan Gigi (General Dental)	31:00 - 33:00	31:00 - 33:00	31.00 - 33.00	31.00 - 33.00
9	Rawatan Gigi (General Dental)	34:00 - 36:00	34:00 - 36:00	34.00 - 36.00	34.00 - 36.00
10	Rawatan Gigi (General Dental)	37:00 - 39:00	37:00 - 39:00	37.00 - 39.00	37.00 - 39.00
11	Rawatan Gigi (General Dental)	40:00 - 42:00	40:00 - 42:00	40.00 - 42.00	40.00 - 42.00
12	Rawatan Gigi (General Dental)	43:00 - 45:00	43:00 - 45:00	43.00 - 45.00	43.00 - 45.00
13	Rawatan Gigi (General Dental)	46:00 - 48:00	46:00 - 48:00	46.00 - 48.00	46.00 - 48.00
14	Rawatan Gigi (General Dental)	49:00 - 51:00	49:00 - 51:00	49.00 - 51.00	49.00 - 51.00
15	Rawatan Gigi (General Dental)	52:00 - 54:00	52:00 - 54:00	52.00 - 54.00	52.00 - 54.00
16	Rawatan Gigi (General Dental)	55:00 - 57:00	55:00 - 57:00	55.00 - 57.00	55.00 - 57.00
17	Rawatan Gigi (General Dental)	58:00 - 60:00	58:00 - 60:00	58.00 - 60.00	58.00 - 60.00
18	Rawatan Gigi (General Dental)	61:00 - 63:00	61:00 - 63:00	61.00 - 63.00	61.00 - 63.00
19	Rawatan Gigi (General Dental)	64:00 - 66:00	64:00 - 66:00	64.00 - 66.00	64.00 - 66.00
20	Rawatan Gigi (General Dental)	67:00 - 69:00	67:00 - 69:00	67.00 - 69.00	67.00 - 69.00
21	Rawatan Gigi (General Dental)	70:00 - 72:00	70:00 - 72:00	70.00 - 72.00	70.00 - 72.00
22	Rawatan Gigi (General Dental)	73:00 - 75:00	73:00 - 75:00	73.00 - 75.00	73.00 - 75.00
23	Rawatan Gigi (General Dental)	76:00 - 78:00	76:00 - 78:00	76.00 - 78.00	76.00 - 78.00
24	Rawatan Gigi (General Dental)	79:00 - 81:00	79:00 - 81:00	79.00 - 81.00	79.00 - 81.00
25	Rawatan Gigi (General Dental)	82:00 - 84:00	82:00 - 84:00	82.00 - 84.00	82.00 - 84.00
26	Rawatan Gigi (General Dental)	85:00 - 87:00	85:00 - 87:00	85.00 - 87.00	85.00 - 87.00
27	Rawatan Gigi (General Dental)	88:00 - 90:00	88:00 - 90:00	88.00 - 90.00	88.00 - 90.00
28	Rawatan Gigi (General Dental)	91:00 - 93:00	91:00 - 93:00	91.00 - 93.00	91.00 - 93.00
29	Rawatan Gigi (General Dental)	94:00 - 96:00	94:00 - 96:00	94.00 - 96.00	94.00 - 96.00
30	Rawatan Gigi (General Dental)	97:00 - 99:00	97:00 - 99:00	97.00 - 99.00	97.00 - 99.00
31	Rawatan Gigi (General Dental)	100:00 - 102:00	100:00 - 102:00	100.00 - 102.00	100.00 - 102.00
32	Rawatan Gigi (General Dental)	103:00 - 105:00	103:00 - 105:00	103.00 - 105.00	103.00 - 105.00
33	Rawatan Gigi (General Dental)	106:00 - 108:00	106:00 - 108:00	106.00 - 108.00	106.00 - 108.00
34	Rawatan Gigi (General Dental)	109:00 - 111:00	109:00 - 111:00	109.00 - 111.00	109.00 - 111.00
35	Rawatan Gigi (General Dental)	112:00 - 114:00	112:00 - 114:00	112.00 - 114.00	112.00 - 114.00
36	Rawatan Gigi (General Dental)	115:00 - 117:00	115:00 - 117:00	115.00 - 117.00	115.00 - 117.00
37	Rawatan Gigi (General Dental)	118:00 - 120:00	118:00 - 120:00	118.00 - 120.00	118.00 - 120.00
38	Rawatan Gigi (General Dental)	121:00 - 123:00	121:00 - 123:00	121.00 - 123.00	121.00 - 123.00
39	Rawatan Gigi (General Dental)	124:00 - 126:00	124:00 - 126:00	124.00 - 126.00	124.00 - 126.00
40	Rawatan Gigi (General Dental)	127:00 - 129:00	127:00 - 129:00	127.00 - 129.00	127.00 - 129.00
41	Rawatan Gigi (General Dental)	130:00 - 132:00	130:00 - 132:00	130.00 - 132.00	130.00 - 132.00
42	Rawatan Gigi (General Dental)	133:00 - 135:00	133:00 - 135:00	133.00 - 135.00	133.00 - 135.00
43	Rawatan Gigi (General Dental)	136:00 - 138:00	136:00 - 138:00	136.00 - 138.00	136.00 - 138.00
44	Rawatan Gigi (General Dental)	139:00 - 141:00	139:00 - 141:00	139.00 - 141.00	139.00 - 141.00
45	Rawatan Gigi (General Dental)	142:00 - 144:00	142:00 - 144:00	142.00 - 144.00	142.00 - 144.00
46	Rawatan Gigi (General Dental)	145:00 - 147:00	145:00 - 147:00	145.00 - 147.00	145.00 - 147.00
47	Rawatan Gigi (General Dental)	148:00 - 150:00	148:00 - 150:00	148.00 - 150.00	148.00 - 150.00
48	Rawatan Gigi (General Dental)	151:00 - 153:00	151:00 - 153:00	151.00 - 153.00	151.00 - 153.00
49	Rawatan Gigi (General Dental)	154:00 - 156:00	154:00 - 156:00	154.00 - 156.00	154.00 - 156.00
50	Rawatan Gigi (General Dental)	157:00 - 159:00	157:00 - 159:00	157.00 - 159.00	157.00 - 159.00
51	Rawatan Gigi (General Dental)	160:00 - 162:00	160:00 - 162:00	160.00 - 162.00	160.00 - 162.00
52	Rawatan Gigi (General Dental)	163:00 - 165:00	163:00 - 165:00	163.00 - 165.00	163.00 - 165.00
53	Rawatan Gigi (General Dental)	166:00 - 168:00	166:00 - 168:00	166.00 - 168.00	166.00 - 168.00
54	Rawatan Gigi (General Dental)	169:00 - 171:00	169:00 - 171:00	169.00 - 171.00	169.00 - 171.00
55	Rawatan Gigi (General Dental)	172:00 - 174:00	172:00 - 174:00	172.00 - 174.00	172.00 - 174.00
56	Rawatan Gigi (General Dental)	175:00 - 177:00	175:00 - 177:00	175.00 - 177.00	175.00 - 177.00
57	Rawatan Gigi (General Dental)	178:00 - 180:00	178:00 - 180:00	178.00 - 180.00	178.00 - 180.00
58	Rawatan Gigi (General Dental)	181:00 - 183:00	181:00 - 183:00	181.00 - 183.00	181.00 - 183.00
59	Rawatan Gigi (General Dental)	184:00 - 186:00	184:00 - 186:00	184.00 - 186.00	184.00 - 186.00
60	Rawatan Gigi (General Dental)	187:00 - 189:00	187:00 - 189:00	187.00 - 189.00	187.00 - 189.00
61	Rawatan Gigi (General Dental)	190:00 - 192:00	190:00 - 192:00	190.00 - 192.00	190.00 - 192.00
62	Rawatan Gigi (General Dental)	193:00 - 195:00	193:00 - 195:00	193.00 - 195.00	193.00 - 195.00
63	Rawatan Gigi (General Dental)	196:00 - 198:00	196:00 - 198:00	196.00 - 198.00	196.00 - 198.00
64	Rawatan Gigi (General Dental)	199:00 - 201:00	199:00 - 201:00	199.00 - 201.00	199.00 - 201.00
65	Rawatan Gigi (General Dental)	202:00 - 204:00	202:00 - 204:00	202.00 - 204.00	202.00 - 204.00
66	Rawatan Gigi (General Dental)	205:00 - 207:00	205:00 - 207:00	205.00 - 207.00	205.00 - 207.00
67	Rawatan Gigi (General Dental)	208:00 - 210:00	208:00 - 210:00	208.00 - 210.00	208.00 - 210.00
68	Rawatan Gigi (General Dental)	211:00 - 213:00	211:00 - 213:00	211.00 - 213.00	211.00 - 213.00
69	Rawatan Gigi (General Dental)	214:00 - 216:00	214:00 - 216:00	214.00 - 216.00	214.00 - 216.00
70	Rawatan Gigi (General Dental)	217:00 - 219:00	217:00 - 219:00	217.00 - 219.00	217.00 - 219.00
71	Rawatan Gigi (General Dental)	220:00 - 222:00	220:00 - 222:00	220.00 - 222.00	220.00 - 222.00
72	Rawatan Gigi (General Dental)	223:00 - 225:00	223:00 - 225:00	223.00 - 225.00	223.00 - 225.00
73	Rawatan Gigi (General Dental)	226:00 - 228:00	226:00 - 228:00	226.00 - 228.00	226.00 - 228.00
74	Rawatan Gigi (General Dental)	229:00 - 231:00	229:00 - 231:00	229.00 - 231.00	229.00 - 231.00
75	Rawatan Gigi (General Dental)	232:00 - 234:00	232:00 - 234:00	232.00 - 234.00	232.00 - 234.00
76	Rawatan Gigi (General Dental)	235:00 - 237:00	235:00 - 237:00	235.00 - 237.00	235.00 - 237.00
77	Rawatan Gigi (General Dental)	238:00 - 240:00	238:00 - 240:00	238.00 - 240.00	238.00 - 240.00
78	Rawatan Gigi (General Dental)	241:00 - 243:00	241:00 - 243:00	241.00 - 243.00	241.00 - 243.00
79	Rawatan Gigi (General Dental)	244:00 - 246:00	244:00 - 246:00	244.00 - 246.00	244.00 - 246.00
80	Rawatan Gigi (General Dental)	247:00 - 249:00	247:00 - 249:00	247.00 - 249.00	247.00 - 249.00
81	Rawatan Gigi (General Dental)	250:00 - 252:00	250:00 - 252:00	250.00 - 252.00	250.00 - 252.00
82	Rawatan Gigi (General Dental)	253:00 - 255:00	253:00 - 255:00	253.00 - 255.00	253.00 - 255.00
83	Rawatan Gigi (General Dental)	256:00 - 258:00	256:00 - 258:00	256.00 - 258.00	256.00 - 258.00
84	Rawatan Gigi (General Dental)	259:00 - 261:00	259:00 - 261:00	259.00 - 261.00	259.00 - 261.00
85	Rawatan Gigi (General Dental)	262:00 - 264:00	262:00 - 264:00	262.00 - 264.00	262.00 - 264.00
86	Rawatan Gigi (General Dental)	265:00 - 267:00	265:00 - 267:00	265.00 - 267.00	265.00 - 267.00
87	Rawatan Gigi (General Dental)	268:00 - 270:00	268:00 - 270:00	268.00 - 270.00	268.00 - 270.00
88	Rawatan Gigi (General Dental)	271:00 - 273:00	271:00 - 273:00	271.00 - 273.00	271.00 - 273.00
89	Rawatan Gigi (General Dental)	274:00 - 276:00	274:00 - 276:00	274.00 - 276.00	274.00 - 276.00
90	Rawatan Gigi (General Dental)	277:00 - 279:00	277:00 - 279:00	277.00 - 279.00	277.00 - 279.00
91	Rawatan Gigi (General Dental)	280:00 - 282:00	280:00 - 282:00	280.00 - 282.00	280.00 - 282.00
92	Rawatan Gigi (General Dental)	283:00 - 285:00	283:00 - 285:00	283.00 - 285.00	283.00 - 285.00
93	Rawatan Gigi (General Dental)	286:00 - 288:00	286:00 - 288:00	286.00 - 288.00	286.00 - 288.00
94	Rawatan Gigi (General Dental)	289:00 - 291:00	289:00 - 291:00	289.00 - 291.00	289.00 - 291.00
95	Rawatan Gigi (General Dental)	292:00 - 294:00	292:00 - 294:00	292.00 - 294.00	292.00 - 294.00
96	Rawatan Gigi (General Dental)	295:00 - 297:00	295:00 - 297:00	295.00 - 297.00	295.00 - 297.00
97	Rawatan Gigi (General Dental)	298:00 - 300:00	298:00 - 300:00	298.00 - 300.00	298.00 - 300.00
98	Rawatan Gigi (General Dental)	301:00 - 303:00	301:00 - 303:00	301.00 - 303.00	301.00 - 303.00
99	Rawatan Gigi (General Dental)	304:00 - 306:00	304:00 - 306:00	304.00 - 306.00	304.00 - 306.00
100	Rawatan Gigi (General Dental)	307:00 - 309:00	307:00 - 309:00	307.00 - 309.00	307.00 - 309.00

Figure 15. The service and price interface.

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