

**Project Report**  
*on*  
**Intelligent Customer**  
**Helpdesk with Smart**  
**Document Understandin**  
**g**  
*in*

**Artificial Intelligence**

*by*

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# 1. Introduction

## 1.1 Overview

We will build a chatbot that uses various Watson AI Services (Watson Discovery, Watson Assistant, Watson Cloud Functions and Node-Red) to deliver an effective Web based UI through which we can chat with the assistant.

We will integrate the Watson Discovery service with Watson Assistant using webhooks.

- 1.** Project Requirements : Node-RED , IBMCloud , IBMWatson , NodeJS
- 2.** Functional Requirements : IBMCloud
- 3.** Technical Requirements : AI , ML , WatsonAI , NodeJS
- 4.** Software Requirements : Watson Assistant, Watson Discovery, Watson Cloud Functions, Node-RED
- 5.** Project Deliverables : Intelligent Chatbot with Smart Document Understanding
- 6.** Project Team : Saumitra Shankar Srivastava
- 7.** Project Duration : 19 Days

## 1.2 Purpose

The typical customer care chatbot can answer simple questions, such as store locations and hours, directions, and maybe even making appointments. When a question falls outside of the scope of the pre-determined question set, the option is typically to tell the customer the question isn't valid or offer to speak to a real person.

In this project, there will be another option. If the customer question is about the operation of a device, the application shall pass the question onto Watson Discovery Service, which has been pre-loaded with the device's owners manual. So now, instead of "Would you like to speak to a customer representative?" we can return relevant sections of the owners manual to help solve our customers' problems. So unless and until customer specifically asks for a customer representative the bot will try to solve all your queries.

To take it a step further, the project shall use the Smart Document Understanding feature of Watson Discovery to train it on what text in the owners manual is important and what is not. This will improve the answers returned from the queries. Then using Watson actions as webhook, Watson Discovery can be integrated with Watson assistant. Finally using Node-Red, Watson assistant can be integrated with a web UI. This UI can then be used to connect with Watson assistant and chat with it.

## **Scope of Work**

- Create a customer care dialog skill in Watson Assistant .
- Use Smart Document Understanding to build an enhanced Watson Discovery collection.
- Create an IBM Cloud Functions web action that allows Watson Assistant to post queries to Watson Discovery.
- Build a web application with integration to all these services & deploy the same on IBM Cloud Platform.

## **2. Literature Survey**

### **2.1 Existing Problem**

The typical customer care chatbot can answer simple questions, such as store locations and hours, directions, and maybe even making appointments. When a question falls outside of the scope of the pre-determined question set, the option is typically to tell the customer the question isn't valid or offer to speak to a real person.

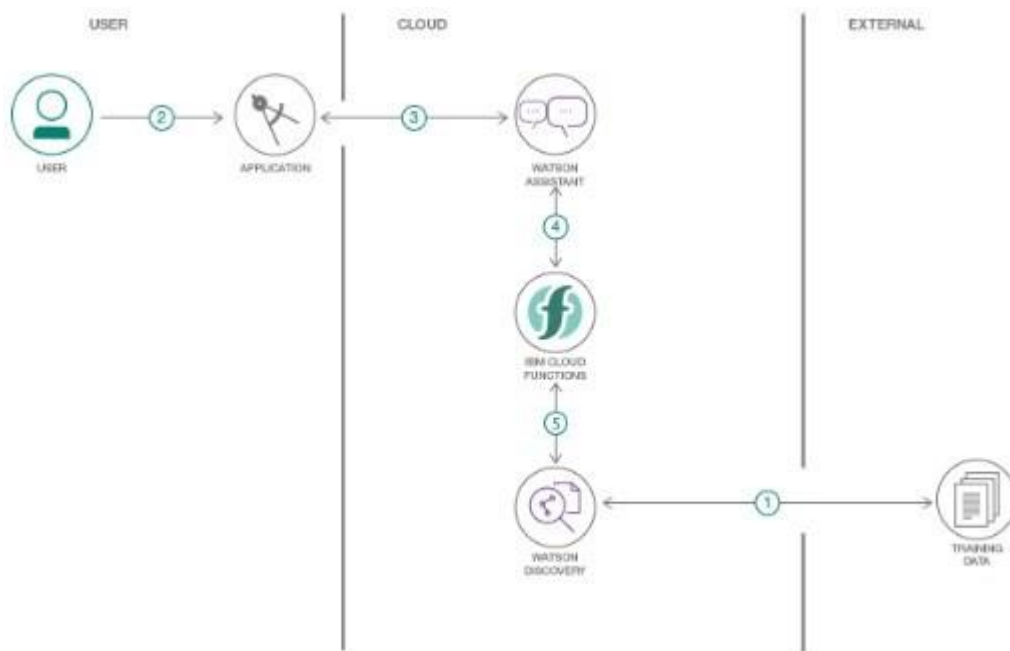
### **2.2 Proposed Solution**

In this project, there will be another option. If the customer question is about the operation of a device, the application shall pass the question onto Watson Discovery Service, which has been pre-loaded with the device's owners manual. So now, instead of "Would you like to speak to a customer representative?" we can return relevant sections of the owners manual to help solve our customers' problems. So unless and until customer specifically asks for a customer representative the bot will try to solve all your queries.

To take it a step further, the project shall use the Smart Document Understanding feature of Watson Discovery to train it on what text in the owners manual is important and what is not. This will improve the answers returned from the queries. Then using Watson actions as webhook, Watson Discovery can be integrated with Watson assistant. Finally using Node-Red, Watson assistant can be integrated with a webUI. This UI can then be used to connect with Watson assistant and chat with it.

## 3. Theoretical Analysis

### 3.1 Block / Flow Diagram



### 3.2 Hardware /Software Designing

1. Create necessary Watson Services.
2. Configure Watson Discovery.
3. Create Watson Cloud Functions Action.
4. Configure Watson Assistant.
5. Integrate Watson Discovery with Watson Assistant using webhooks.
6. Build Node-RED flow to integrate Watson Assistant and Web Dashboard.

## 4. Experimental Investigation

CHATBOT

Bluetooth Bot

Enter the input  
what is bluetooth

SUBMITCANCEL

input what is bluetooth

Response

Online Bot

"Kia's Bluetooth® system is a wireless technology that allows hands-free use of cellular phones in Kia Bluetooth® vehicles.\* Kia's Bluetooth® technology oGLYPHers important advantages"

CHATBOT

Bluetooth Bot

Enter the input  
how to setup menu

SUBMITCANCEL

input how to setup menu

Response

Online Bot

"Press talk (steering Wheel Button) Radio displays "listening" and emits prompt tone 3. say "setup" "say pair phone, select phone, delete phone, change priority, or Bluetooth oGLYPH" 4. at the setup menu, say, "pair phone" "Pair phone; say yes"

CHATBOT

Bluetooth Bot

Enter the input

SUBMIT

CANCEL

input tell me troubleshooting tips

Response

Online Bot

"A B c OpERATInG Tips: need to quit? • Press MODE end Button at anytime need help? • say "help" at anytime and the system will say the available menu options"

CHATBOT

Bluetooth Bot

Enter the input

SUBMIT

CANCEL

input how to control radio system

Response

Online Bot

"UsER ActIOn KIA BLUETOOTH® sYsTEm REsPOnsE Ring tone through the audio system, caller Id displayed on the radio with "IncOmInG" 1. Press ReceiVe button Radio displays "active call""

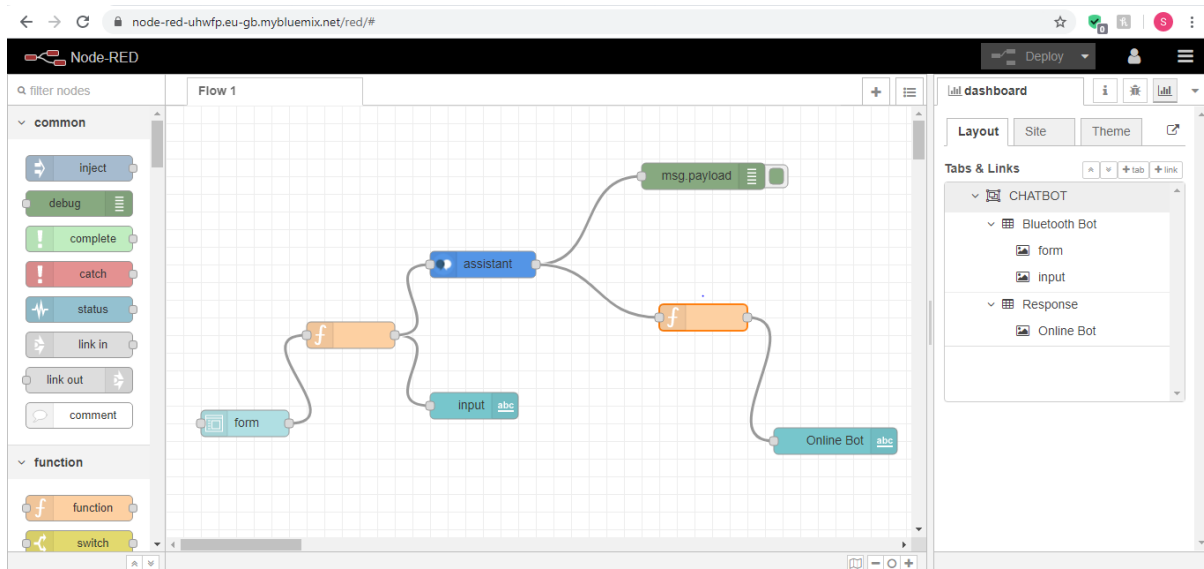
## 5. Flowchart

Insert the following nodes into the flow in Node-RED.

- Inject
- Debug
- form
- text



- function
- Assistant



## 6. Results

Web based UI was developed by integrating all the services using Node-RED.

URL for UI Dashboard : <https://node-red-uhwfp.eu-gb.mybluemix.net/ui/#!/0?socketid=3nq6ArplM6vWD6OsAABS>

## 7. Advantages & Disadvantages

### Advantages

1. Reduces Man power
2. Cost Efficient
3. Less and less calls will be diverted to Customer Representatives.

## **Disadvantages**

1. Sometimes it can mislead customers as it tries to search irrelevant information in the manual.
2. It may also give same answers to different queries.

## **8. Applications**

1. This chatbot can be deployed to various websites as it can solve a lot of basic questions.
2. It can be used to deploy as Customer Helpdesk for small scale products as their manual usually has the solution for the user's problems.

## **9. Conclusion**

An Intelligent Customer Helpdesk Chatbot was created using various Watson services like Watson Discovery, Watson Assistant, Watson Cloud Functions and Node-RED.

## **10. Future Scope**

In the future, various other Watson services like Text-To-Speech and Speech-To-Text can be integrated in the chatbot. This can make the chatbot Hands-free.

# 11. Bibliography

1. Node-RED Starter Application:

<https://developer.ibm.com/tutorials/how-to-create-a-node-red-starter-application/>

2. Build your own AI assistant

:<https://www.youtube.com/watch?v=hitUOFNne14>

3. How to use Watson Assistant with Webhooks:

<https://www.youtube.com/embed/5z3i5IsBVnk>

4. Watson Discovery

:<https://developer.ibm.com/articles/introduction-watson-discovery/>

## Appendix

### Source Code

#### Node-RED Flow code

```
[  
  {  
    "id": "e33fd96c.b1f498",  
    "type": "tab",
```

```
"label":  
"Flow    1",  
"disabled":  
false, "info":  
""  
},  
{  
  "id": "4719271e.f67278",  
  "type": "debug",  
  "z": "e33fd96c.b1f498",  
  "name": "",  
  "active":  
  false,  
  "tosidebar":  
  true,  
  "console":  
  false,  
  "tostatus":  
  false,  
  "complete":  
  "payload",  
  "targetType":  
  "msg", "x": 610,  
  "y": 180,
```

```

    "wires": []
  },
  {
    "id": "f09213bd.f0c9b",
    "type": "ui_text",
    "z":
    "e33fd96c.b1f498",
    "group":
    "d0a6c0ac.8980d",
    "order": 2,
    "width": 10,
    "height": 2,
    "name":
    "Query",
    "label": "User Input",
    "format":
    "{{msg.payload}}",
    "layout": "col-center",
    "x": 790,
    "y": 240,
    "wires": [],
    "inputLabels"
    : [
      "asd"
    ]
  },
  {
    "id": "6783034d.ab58ec",
    "type": "watson-
conversation-v1", "z":
    "e33fd96c.b1f498",
    "name": "",

```

```
"workspaceid": "7f61646e-240e-43be-9e45-53f8eeeb2038", "multiuser": false,
"context": false,
"empty-payload":
false, "service-
endpoint": "",
"timeout": "",
"optout-learning":
false, "x": 780,
"y": 400,
"wires
  ": [ [
    "c4de52e9.4afa1"
    ,
    "2a9036a7.6e21d
    a"
  ]
```

```

    ]
  },
  {
    "id": "3fac1262.28ad6e",
    "type": "ui_text",
    "z":
      "e33fd96c.b1f498",
    "group":
      "ff862856.2e9e98",
    "order": 1,
    "width": 15,
    "height": 13,
    "name":
      "Response",
    "label": "",
    "format":
      "{{msg.payload}}",
    "layout": "row-
spread",
    "x": 1160,
    "y": 240,
    "wires": []
  },
  {
    "id": "a4d26d94.bf4a9",
    "type": "debug",
    "z": "e33fd96c.b1f498",
    "name": "",
    "active": true,
    "tosidebar":
      true,
    "console":

```

```

false,
"tostatus":
false,
"complete":
"payload",
"targetType":
"msg", "x": 1170,
"y": 360,
"wires": []
},
{
  "id": "c4de52e9.4afa1",
  "type": "function",
  "z": "e33fd96c.b1f498",
  "name": "",
  "func": "msg.payload.text=\"\";
\nif(msg.payload.context.webhook_result_1)\n{
\n  for(var i in msg.payload.context.webhook_result_1.results)\n  { \n

```



```

msg.payload.text=msg.payload.text+"\<br>" +msg.payload.con
ext.webhook_result_1.results[i].subtitle;\n
msg.payload.text=msg.payload.text+"\<br><br>" +msg.payload
.context.webhook_re sult_1.results[i].text+"\<br>"; \n      } \n
                                msg.payload=msg.payload.text; \n  \n}
\nelse
\nmsg.payload =
  msg.payload.output.text[0];\nreturn msg; ",
  "outputs": 1,
  "noerr": 0,
  "x": 970,
  "y": 320,
  "wires
    ": [ [
      "a4d26d94.bf4a9"
      ,
      "3fac1262.28ad6e
      "
    ]
  ]
},
{
  "id": "7d69ebf8.9cafb4",
  "type": "ui_form",
  "z": "e33fd96c.b1f498",
  "name": "",
  "label": "",
  "group":
  "d0a6c0ac.8980d",
  "order": 4,
  "width": 10,
  "height": 2,

```

```
"options": [  
  {  
    "label": "Enter your  
    Query", "value":  
    "query",  
    "type":  
    "text",  
    "required":  
    true,  
    "rows": null  
  }  
],  
"formValue": {  
  "query": ""  
},  
"payload": "",  
"submit": "Submit",
```

```

"cancel": "Cancel",
"topic":
"", "x":
390,
"y": 320,
"wires
  ": [ [
    "4719271e.f67278",
    "2b6857ad.e2ef98"
  ]
]
},
{
  "id": "2b6857ad.e2ef98",
  "type": "function",
  "z": "e33fd96c.b1f498",
  "name": "",
  "func": "msg.payload =
msg.payload.query\nreturn msg;",
  "outputs": 1,
  "noerr": 0,
  "x": 590,
  "y": 320,
  "wires
    ": [ [
      "6783034d.ab58ec",
      "f09213bd.f0c9b"
    ]
  ]
},
{
  "id": "2a9036a7.6e21da",

```

```
"type": "debug",  
"z": "e33fd96c.b1f498",  
"name": "",  
"active": true,  
"tosidebar":  
true,  
"console":  
false,  
"tostatus":  
false,  
"complete":  
"false", "x":  
990,  
"y": 480,
```

```

    "wires": []
  },
  {
    "id": "56cf0c53.866104",
    "type": "ui_button",
    "z": "e33fd96c.b1f498",
    "name": "",
    "group":
    "d0a6c0ac.8980d",
    "order": 1,
    "width": 10,
    "height": 1,
    "passthru":
    false, "label":
    "Reset",
    "tooltip": "",
    "color": "",
    "bgcolor": "cyan",
    "icon": "",
    "payload":
    "true",
    "payloadType":
    "bool", "topic":
    "",
    "x": 230,
    "y": 480,
    "wires
    ": [ [
      "a20966a1.6843c8"
    ]
  ]
},

```

```
{  
  "id": "a20966a1.6843c8",  
  "type": "switch",  
  "z": "e33fd96c.b1f498",  
  "name": "",  
  "property":  
  "payload",  
  "propertyType":  
  "msg", "rules": [  
    {  
      "t": "true"  
    }  
  ],  
}
```

```

"checkall":
"false",
"repair":
false,
"outputs": 1,
"x": 410,
"y": 480,
"wires
  ": [ [
    "e1a2b793.b6591
    8",
    "3185b04c.79b1"
  ]
]
},
{
  "id": "e1a2b793.b65918",
  "type": "function",
  "z": "e33fd96c.b1f498",
  "name": "",
  "func": "msg.payload =
  \"welcome\\\"\\nreturn msg;\", \"outputs\":
  1,
  \"noerr\": 0,
  \"x\": 570,
  \"y\": 480,
  \"wires
    \": [ [
      \"6783034d.ab58ec\"
    ]
  ]
},

```

```
{  
  "id": "7454fe98.2d066",  
  "type": "inject",  
  "z": "e33fd96c.b1f498",  
  "name": "",  
  "topic": "",  
  "payload":  
    "true",  
  "payloadType":  
    "bool", "repeat":  
    "",  
  "crontab": "",  
  "once": true,  
  "onceDelay":  
    "0.0",
```



```

"x": 210,
"y": 380,
"wires
  ": [ [
    "a20966a1.6843c8"
  ]
]
},
{
  "id": "3185b04c.79b1",
  "type": "function",
  "z": "e33fd96c.b1f498",
  "name": "",
  "func": "msg.payload =
\\\"\\nreturn msg;", "outputs": 1,
  "noerr": 0,
  "x": 190,
  "y": 240,
  "wires
    ": [ [
      "7d69ebf8.9cafb4"
    ,
      "f09213bd.f0c9b"
    ]
  ]
},
{
  "id": "d0a6c0ac.8980d",
  "type": "ui_group",
  "z": "",
  "name": "Chatbox",
  "tab":

```

```
"5e75ce40.2a426",  
"order": 1,  
"disp": true,  
"width": "10",  
"collapse":  
false  
},  
{  
  "id": "ff862856.2e9e98",  
  "type": "ui_group",  
  "z": "",
```

```

    "name": "Bot
    Response",
    "tab":
    "5e75ce40.2a426
    ", "order": 2,
    "disp": true,
    "width":
    "15",
    "collapse":
    false
  },
  {
    "id": "5e75ce40.2a426",
    "type": "ui_tab",
    "z": "",
    "name": "Intelligent Customer Help Desk With Smart
    Document Understanding", "icon": "dashboard",
    "disabled":
    false,
    "hidden":
    false
  }
]

```

## Watson Cloud Function Action Code

```

/**
 *
 * @param {object} params
 * @param {string} params.iam_apikey
 * @param {string} params.url

```

```

* @param {string} params.username
* @param {string} params.password
* @param {string} params.environment_id
* @param {string} params.collection_id
* @param {string} params.configuration_id
* @param {string} params.input
*
* @return {object}
*
*/

```

```

const assert = require('assert');

```

```

const    DiscoveryV1    =    require('watson-developer-
cloud/discovery/v1');

```

```

/**
*
* main() will be run when you invoke this action
*
* @param Cloud Functions actions accept a single parameter,
which must be a JSON object.
*
* @return The output of this action, which must be a JSON object.
*
*/

```

```
function main(params) {  
  return new Promise(function (resolve, reject) {  
  
    let discovery;  
  
    if (params.iam_apikey){  
      discovery = new DiscoveryV1({  
        'iam_apikey': params.iam_apikey,  
        'url': params.url,  
        'version': '2019-03-25'  
      });  
    }  
    else {  
      discovery = new DiscoveryV1({  
        'username': params.username,  
        'password': params.password,  
        'url': params.url,  
        'version': '2019-03-25'  
      });  
    }  
  
    discovery.query({  
      'environment_id': params.environment_id,  
      'collection_id': params.collection_id,
```

```
'natural_language_query': params.input,
'passages': true,
'count': 3,
'passages_count': 3
}, function(err, data) {
if (err) {
return reject(err);
}
return resolve(data);
});
});
}
```