Warren J. Baker Endowment
for Excellence in Project-Based Learning
Robert D. Koob Endowment *for Student Success*

FINAL REPORT

I.   Project Title: Artificial Intelligence Customer Support System

II.   Project Completion Date: Dec 31, 2018

III.   Student(s), Department(s), and Major(s)

   (1) Jenny Wang, Department of Computer Science & Orfalea College of Business, CS & MBA

   (2) Andrew Engel, Department of Computer Science, Computer Science

   (3) Alex Engel, Department of Computer Science, Computer Science

IV.   Faculty Advisor and Department

   Prof. Franz J. Kurfess, Department of Computer Science

V.   Cooperating Industry, Agency, Non-Profit, or University Organization(s)

   Cal Poly Recreation Center, Cal Poly Associated Students, Inc.

   Facility Services, Cal Poly State University, San Luis Obispo, California

   California Fresh Market SLO, San Luis Obispo, California

   Fitch, Even, Tabin & Flannery LLP

VI.   Executive Summary

The purpose of this project was originally targeted at Cal Poly facility department. We tried to help the service teams improve the service efficiency by building an automatic customer request response system. After a few months of research and development including user study, usability study, and infrastructure design, the team reached a conclusion that the system can be improved with advanced artificial intelligence and machine learning technologies and techniques to expand to broader application scenarios beyond Cal Poly

facility. Therefore, this report aims to summarize the achievement of the team. The principles and the system design can be tailored toward different industries with minor modification of the applications.

The team has made significant accomplishments in the following areas:

- Needs assessment: We carried out the user studies to understand the problem in the real business customer service process and customer experience by interviewing end-users. A usability study and evaluation report were completed to enhance the system and application with engaging User Interface and User Experience (UI/UX).

- Prototyping: We designed a series of protypes with minimal viable product (MVP) to demonstrate the feasibility of the system. The architecture of the system includes a unique human and machine interaction interface, which was incorporated with conversational UI and QR code technology. The back-end system utilizes artificial intelligence (AI) and machine learning technologies to provide an instant automatic customer support using a model-based program. Through a few of testing iterations on the MVP, customer feedback was collected to help improve the next round of design improvement.

- Dissemination: The project was introduced at National Automatic Merchandising Association conference in 2018 to over 35 vendors worldwide. A scientific publication is under preparation for Association for Computing Machinery (ACM) conference. A provisional patent for the designed algorithm is being prepared to file.

The learnings from this project is tremendous for the team. With "learn by doing" in mind, we followed the software design and development methodology learned from the classroom and applied to this project successfully.

VII. Major Accomplishments

(1) We conducted multiples studies such as user study, user experience study, and usability studies to access the pain points and needs from the end-users. We adopted a rapid-evaluation approach to effectively identify the major areas of concerns.

(2) We built a completed application running on the server in the cloud to provide real-time requests, analyze unstructured data from the conversations, and update the real-time database. Both rational and non-rational databases were designed to support knowledge

retrieving and updating. In addition, we designed a Machine learning Algorithm and Markov model to intelligently respond to users' response with relevant information; The natural language processing tools with topic modeling technique were applied to automatically identify and classify the key topic in the request texts for future analysis.

(3) We received hundreds of responses from online survey and face-to-face interviews. The participants had positive reactions to our application including:

- Easy to use

- Spend much less time on a regular request

- Easy to interact with the system without training

VIII.   Expenditure of Funds

Student Applicant(s): Jenny Z. Wang, Andrew Engel, Alex Engel	
Faculty Advisor: Prof. Franz J. Kurfess	
Project Title: Artificial Intelligence Customer Support System	**Requested Endowment Funding**
Travel *subtotal*	
Travel: In-state	
Travel: Out-of-state	**$628.90**
Travel: International	
Operating Expenses *subtotal*	
Non-computer Supplies & Materials	
Computer Supplies & Materials	
Software/Software Licenses	**$1,832.29**
Printing/Duplication	
Postage/Shipping	
Registration	
Membership Dues & Subscriptions	
Multimedia Services	
Advertising	
Journal Publication Costs	
Contractual Services *subtotal*	
Contracted Services	**$2500**
Equipment Rental/Lease Agreements	
Service/Maintenance Agreements	
Total	**$4,961.19**

IX.   Impact on Student Learning

The team learned a lot during the development of this project. The key learnings are:

- We learned to build an effective and dynamic team. The team is multidisciplinary with each member has different background and strength. How to coordinate and create a synergy is the key to success. We managed the challenges through effective communications, constructive discussions, and aligned on many tasks in the project to deliver a final workable product.

- Project management. Effective project management skills are necessary to meet the goals in the relative short period of time. We developed a detailed project tasks and timeline, with deliverables and owners clearly identified.

- Apply the knowledge learned from classroom. We used the knowledge learned from computer science classroom in this project, including database, front end development, artificial intelligence, natural language processing, and many others. Cal Poly's curriculum is very effective to prepare students to solve real world problems.

We really appreciate the funding opportunities and the donors who make this great learning experience happening.