Team: AVIAR

Project: Child-Parent Pairing System

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1. Product Concept

This section describes the purpose, use, and intended user audience for the Child-Parent Pairing System (CPPS). The CPPS is an authentication infrastructure that performs secure matching between parents and children at child care facilities. Users of the CPPS will be able to verify the parent picking up the child and identify the child that belongs to that parent by way of a hardware device that the child will wear.

1.1 Purpose and Use

The Child-Parent Pairing System shall allow parents to check their children in to the facility and register them at a central check-in area. At that point they should provide their information through their state ID, and the following information via a form that will be filled out on their first visit: Child’s name, parent’s name, and emergency phone number. The child should then be fitted with a hardware device. Each time one of these devices is distributed, it should be tested to ensure that it is functioning properly and has been securely and properly assigned to their parent. This device is to be worn throughout their time at the facility until their parent arrives again to pick them up. When the parent arrives, staff will verify the parent information– if there is a match, a message will be sent to the child’s device to indicate that the child should return to the base station to be picked up. A final check should be performed before the child removes the device to ensure that the child and parent do in fact match.

1.2 Intended Audience

The Child-Parent Pairing System is intended for use in facilities where childcare is provided. A few examples are as follows: Daycare centers, churches that have children’s services or programming (e.g. Sunday school), or possibly even schools that may have an after-school program or weekend classes. Therefore, the consumers will generally be organizations or companies, as opposed to individuals.
Figure 1.1: Key Components
2. Product Description and Functional Overview

This section provides the reader with an overview of the Child-Parent Pairing System. The primary operational aspects of the product, from the perspective of end users, maintainers, and administrators, are defined here. The key features and functions found in the product, as well as critical user interactions and user interfaces are described in detail.

2.1 Features and Functions

The Child-Parent Pairing System allows for safe and secure matching, facilitated by the inherent and implicit efficiency of the computer system implementation. The system will verify and identify the parent by state ID at drop-off and pick-up. It will also assign an electronic hardware device to be fitted to the child — this device will be linked to the information of the parent so that the safe match can be made at the pick-up time.

There will be a base station that will attach to an existing computer via USB cable. On this base station, card scanner and key pad to receive parent’s information. Parent’s information from the system will be linked to that particular device before it is placed on the child.
2.2 External Inputs and Outputs

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity Verification</td>
<td>Record of a parent’s state ID information and PIN number</td>
<td>Identification and authentication</td>
</tr>
<tr>
<td>Personal Information</td>
<td>Child’s name, parent’s name, and emergency phone number</td>
<td>Additional verification of identity and contact information in case of emergency</td>
</tr>
<tr>
<td>Child Device ID</td>
<td>A unique identifier that resides on the child device</td>
<td>To send the pick-up signal to the correct child device by distinguishing amongst them</td>
</tr>
</tbody>
</table>

Table 2.1: Inputs and Outputs

2.3 Product Interfaces

The Base Station will simply be a box with a state ID reader and key pad embedded on the top of it. The only other visible aspect of the module to most users will be the wire running to the PC.

Figure 2.1: Base Station
New User Registration

Child’s Name: 
Parent’s Name: 
Emergency Phone Number: 
Submit

Figure 2.2: New User Registration Screen (Mockup)

Check in/out

Child-Parent Pairing System

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Name</td>
<td>John Doe</td>
</tr>
<tr>
<td>Address</td>
<td>1300 Mall avenue, Arlington TX</td>
</tr>
<tr>
<td>Driver’s Licence</td>
<td>1234567890</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Check-in</th>
<th>Check-out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov-12-2012</td>
<td>9:01 AM</td>
<td>12:03 PM</td>
</tr>
<tr>
<td>Nov-6-2012</td>
<td>3:00 PM</td>
<td>4:42 PM</td>
</tr>
<tr>
<td>Oct-20-2012</td>
<td>2:03 PM</td>
<td>5:02 PM</td>
</tr>
<tr>
<td>Oct-20-2012</td>
<td>8:02 AM</td>
<td>1:34 PM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnny Doe</td>
<td>6</td>
</tr>
<tr>
<td>Jenny Doe</td>
<td>8</td>
</tr>
</tbody>
</table>

Actions

Check-in  Check-out  Edit info  Main Screen

Figure 2.3: Main Screen (Mockup)
The rack that will hold the child devices will be a simple, slotted bar that will allow for each piece of hardware to fit into its own groove.

Figure 2.4: Child Device Rack
3. Customer Requirements

This section provides the basic functions, features and appearance of the product as requested by the customer. The following requirements were gathered by team AVIAR from sponsor of the project – Mr. David Levine. This section specifies what the intended audience can and cannot do.

3.1 Child-Care Facility

3.1.1 Description

The product shall be able to pair a child with his/her parent in a large child-care facility.

3.1.2 Source

Sponsor

3.1.3 Constraints

The term “large” refers to facilities that can hold up to 50 children at one time. Anything above that is outside the scope of this project.

3.1.4 Standards

N/A

3.1.5 Priority

1 – Critical

3.2 Easy Pairing

3.2.1 Description

The product shall provide an easy way to pair the child with his/her parent. The term “easy” refers to how easy is the pairing process in terms of time and in terms of how complicated it is.
3.2.2 Source

Sponsor

3.2.3 Constraints

Pairing shall not take more than 3 minutes for the first time (registration time included), and not more than 1 minute every time after that. The pairing shall be very intuitive and shall not require any extra knowledge from both the parent of the child.

3.2.4 Standards

N/A

3.2.5 Priority

1 – Critical

3.3 Secure Pairing

3.3.1 Description

The product shall provide a secure way to pair the child with his/her parent. The “secure” term refers to uniquely identifying the child-parent pair.

3.3.2 Source

Sponsor

3.3.3 Constraints

The product shall support parents/legal guardians/care takers with multiple children, or a child with multiple parents/guardians/care takers.

3.3.4 Standards

N/A

3.3.5 Priority

1 – Critical

3.4 Registration

3.4.1 Description
The product shall provide functionality to register a child-parent pair.

3.4.2 Source

Sponsor and team AVIAR

3.4.3 Constraints

N/A

3.4.4 Standards

N/A

3.4.5 Priority

1 – Critical

3.5 Identification Pairing Registration

3.5.1 Description

The product shall allow parent and child to register in a manner to ensure identification pairing.

3.5.2 Source

Sponsor

3.5.3 Constraints

N/A

3.5.4 Standards

N/A

3.5.5 Priority

1 – Critical

3.6 Wearable Unit

3.6.1 Description

The product shall have a wearable unit.
3.6.2 Source
Sponsor and team AVIAR

3.6.3 Constraints
N/A

3.6.4 Standards
N/A

3.6.5 Priority
1 – Critical

3.7 Wireless Wearable Unit

3.7.1 Description
The wearable unit shall operate wirelessly.

3.7.2 Source
Sponsor and team AVIAR

3.7.3 Constraints
The wearable unit shall not have any external antennas.

3.7.4 Standards
N/A

3.7.5 Priority
1 – Critical

3.8 Age Limitations

3.8.1 Description
The wearable unit shall be designed for children of a certain age up.

3.8.2 Source
3.8.3 Constraints

The age limitation refers to an age when the child is aware that the wearable device alert means something and the child can act upon it. That age was established as minimum of 3 years old.

3.8.4 Standards

N/A

3.8.5 Priority

1 – Critical

3.9 Charging Rack

3.9.1 Description

There shall be a charging station that charges the child unit(s).

3.9.2 Source

Sponsor and team AVIAR

3.9.3 Constraints

None

3.9.4 Standards

N/A

3.9.5 Priority

1 – Critical

3.10 Data Security

3.10.1 Description

The data handled by the system shall be secured by being stored offline.

3.10.2 Source
3.10.3 Constraints

None

3.10.4 Standards

N/A

3.10.5 Priority

1 - Critical

3.11 Pick-up Notification

3.11.1 Description

The wearable unit shall let the child know when their parent came to pick him/her up.

3.11.2 Source

Team AVIAR

3.11.3 Constraints

The notification shall be designed to not disturb other children.

3.11.4 Standards

N/A

3.11.5 Priority

2 – High

3.12 Visual Notification

3.12.1 Description

The wearable unit shall be able to visually notify the child.

3.12.2 Source

Team AVIAR
3.12.3 Constraints

N/A

3.12.4 Standards

N/A

3.12.5 Priority

2 – High

3.13 Small Form Factor

3.13.1 Description

The wearable unit shall have a small enough factor to not bother the child while performing children related tasks while at the child-care facility.

3.13.2 Source

Team AVIAR

3.13.3 Constraints

N/A

3.13.4 Standards

N/A

3.13.5 Priority

2 – High

3.14 Light Weight

3.14.1 Description

The wearable unit shall have a light weight in order to not inconvenience child’s normal functioning while at the child-care facility.

3.14.2 Source

Team AVIAR
3.14.3 Constraints
N/A

3.14.4 Standards
N/A

3.14.5 Priority
2 – High

3.15 Base Unit

3.15.1 Description
The product shall have a base unit.

3.15.2 Source
Sponsor and team AVIAR

3.15.3 Constraints
N/A

3.15.4 Standards
N/A

3.15.5 Priority
2 – High

3.16 Check-in

3.16.1 Description
The base unit shall be used for check-in of the child-parent pair.

3.16.2 Source
Sponsor and team AVIAR

3.16.3 Constraints
3.16.4 Standards
N/A

3.16.5 Priority
2 – High

3.17 Check-out

3.17.1 Description
The base unit shall be used for check-out of the child-parent pair.

3.17.2 Source
Sponsor and team AVIAR

3.17.3 Constraints
N/A

3.17.4 Standards
N/A

3.17.5 Priority
2 – High

3.18 Use Existing Computers

3.18.1 Description
The base unit shall use existing computers.

3.18.2 Source
Sponsor and team AVIAR

3.18.3 Constraints
The unit shall be able to operate with computer with a modern operating system.
3.18.4 Standards

N/A

3.18.5 Priority

2 – High

3.19  Hardware and Software

3.19.1 Description

The base unit shall be composed of both hardware and software.

3.19.2 Source

Team AVIAR

3.19.3 Constraints

N/A

3.19.4 Standards

N/A

3.19.5 Priority

2 – High

3.20  Software Authentication

3.20.1 Description

The software of the base unit shall have a way to authenticate the user.

3.20.2 Source

Sponsor and team AVIAR

3.20.3 Constraints

Username/password authentication method shall be used.

3.20.4 Standards
3.21 Multiple Wearable Units

3.21.1 Description
The product shall support operation of multiple wearable units simultaneously.

3.21.2 Source
Sponsor and team AVIAR

3.21.3 Constraints
The number of wearable units shall be limited to the maximum capacity of the child-care facility.

3.21.4 Standards
N/A

3.21.5 Priority
2 – High

3.22 Graphical User Interface

3.22.1 Description
The software of the base unit shall have a pleasant graphical user interface.

3.22.2 Source
Sponsor and team AVIAR

3.22.3 Constraints
N/A

3.22.4 Standards
3.23 Visually Appealing Child unit

3.23.1 Description

The wearable unit shall be visually appealing.

3.23.2 Source

Sponsor and team AVIAR

3.23.3 Constraints

The colors of the unit shall integrate with the colors of the environment.

3.23.4 Standards

N/A

3.24 Visually Pleasant Base Unit Hardware

3.24.1 Description

The base unit’s hardware shall be visually pleasant to the user.

3.24.2 Source

Sponsor and team AVIAR

3.24.3 Constraints

The colors of the unit shall integrate with the colors of the environment.

3.24.4 Standards

N/A
3.24.5 Priority

4 – Low
4. Packaging Requirements

This section establishes packaging requirements and provides descriptions on the delivered product to the end-user. The requirements shall apply to all parts and accessories that come with the product. The contents within this section are intended to serve as a reference for maintenance and support.

4.1 Hardware Component

4.1.1 Description

The final product that delivered to end-user shall consist of two major units. The base unit shall be fully assembled in a small form factor box. The child unit shall be assembled in a tagging form factor. The child unit shall include more than one, which based on the end-user request. Team AVIAR will be responsible for assembling and operation of base and child unit as well as providing all the accessories. Team AVIAR will not be responsible for any external modifications or damaging to the delivered product.

4.1.2 Source

Team AVIAR

4.1.3 Constraints

- The system unit must be able to fit into a small form factor box.
- The child unit must be able to fit into a small form factor tagging device.

4.1.4 Standards

None

4.1.5 Priority

1 – Critical
4.2 Software Component

4.2.1 Description

The final product software shall be delivered on a Compact Disc and required end-user to install on designated computer.

4.2.2 Source

Team AVIAR

4.2.3 Constraints

The end-user’s computer must a Compact Disc reader (CD-ROM) in order to install the final product software.

4.2.4 Standards

The Compact Disc must comply with ISO 9660, also referred to as CDFS (Compact Disc File System), that published by International Organization for Standardization (ISO) for optical disc media.

4.2.5 Priority

3 – Moderate

4.3 Power Source

4.3.1 Description

The child unit shall be delivered fully charged.

4.3.2 Source

Team AVIAR

4.3.3 Constraints

None

4.3.4 Standards

None

4.3.5 Priority
4.4 **User Manual**

4.4.1 **Description**

The software and hardware component shall be delivered with a user manual.

4.4.2 **Source**

Team AVIAR

4.4.3 **Constraints**

None

4.4.4 **Standards**

The user manual shall follow the information system standard and guidelines manual.

4.4.5 **Priority**

4 – Low

4.5 **Team Logo**

4.5.1 **Description**

The base unit and child unit shall have the team AVIAR’s logo

4.5.2 **Source**

Team AVIAR

4.5.3 **Constraints**

None

4.5.4 **Standards**

None

4.5.5 **Priority**

5 – Future
5. Performance Requirements

The quality of any product is determined by its performance. The following requirements describe the performance characteristics of the child-parent pairing product.

5.1 Open Space Operation

5.1.1 Description

The product shall be able to operate in spaces without walls.

5.1.2 Source

Team AVIAR

5.1.3 Constraints

Distance shall be an average 7000 square feet.

5.1.4 Standards

N/A

5.1.5 Priority

1 – Critical

5.2 Walled Space Operation

5.2.1 Description

The product shall be able to operate in spaces divided by walls.

5.2.2 Source

Team AVIAR
5.2.3 Constraints

Distance shall be an average 5000 square feet.

5.2.4 Standards

N/A

5.2.5 Priority

1 – Critical

5.3 Test Connection

5.3.1 Description

The system shall be able to test the connection between the base unit and the wearable unit.

5.3.2 Source

Team AVIAR

5.3.3 Constraints

Testing shall not take more than 10 seconds.

5.3.4 Standards

N/A

5.3.5 Priority

1 – Critical

5.4 Type of Power Source

5.4.1 Description

The wearable unit shall use a rechargeable power source.

5.4.2 Source

Team AVIAR

5.4.3 Constraints
5.4.4 Standards

N/A

5.4.5 Priority

1 – Critical

5.5 Length of Operation Time

5.5.1 Description

The wearable unit shall be able to work an entire day without recharging.

5.5.2 Source

Team AVIAR

5.5.3 Constraints

Entire day means a full day of operation in the child-care facility. For the scope of this project we limited it to 8 hours.

5.5.4 Standards

N/A

5.5.5 Priority

1 – Critical

5.6 Durability

5.6.1 Description

The wearable unit shall be hard to damage.

5.6.2 Source

Team AVIAR

5.6.3 Constraints
5.6.4 Standards

N/A

5.6.5 Priority

1 – Critical

5.7 Call Time

5.7.1 Description

The wearable unit shall react to the base unit call in no less than 20 seconds.

5.7.2 Source

Team AVIAR

5.7.3 Constraints

N/A

5.7.4 Standards

N/A

5.7.5 Priority

2 – High

5.8 Power Source Replacement

5.8.1 Description

The wearable unit shall operate for at least one year without power source replacement.

5.8.2 Source

Team AVIAR

5.8.3 Constraints

N/A
5.8.4 Standards
N/A

5.8.5 Priority
3 – Moderate

5.9 Charge Time

5.9.1 Description
The wearable unit shall be able to recharge to full capacity in maximum 6 hours.

5.9.2 Source
Team AVIAR

5.9.3 Constraints
N/A

5.9.4 Standards
N/A

5.9.5 Priority
3 – Moderate
6. Safety Requirements

Safety requirements are of very high priority because this product is targeted to be used with small children and their parents. These requirements are critical to protect the user against any injury. Thus, they need to be addressed to the user by providing a clear and easily understandable user manual. Also, the product should include warning labels that can be referred to at any time.

6.1 Operational Frequency

6.1.1 Description

The wireless unit’s operational frequency shall not be harmful to the child.

6.1.2 Source

Team AVIAR

6.1.3 Constraints

N/A

6.1.4 Standards

N/A

6.1.5 Priority

1 – Critical

6.2 Cutting Prevention

6.2.1 Description

The wearable device shall not have any sharp edges.

6.2.2 Source
6.3 Material toxicity

6.3.1 Description

The wearable device shall not have any parts that contain toxic materials that are considered harmful to the child.

6.3.2 Source

Team AVIAR

6.3.3 Constraints

This will include, but not limited to, lead, and mercury.

6.3.4 Standards

N/A

6.3.5 Priority

1 – Critical

6.4 Eye protection

6.4.1 Description:

The visual notification hardware on the wearable unit shall not be harmful to the child’s eyes.

6.4.2 Source
6.4.3 Constraints

N/A

6.4.4 Standards

N/A

6.4.5 Priority

1 – Critical

6.5 Removability

6.5.1 Description

The wearable unit shall not be easily removed by the child.

6.5.2 Source

Team AVIAR

6.5.3 Constraints

The device shall be easy to put on and take off of the child, but difficult for the child to remove.

6.5.4 Standards

N/A

6.5.5 Priority

1 – Critical
7. Maintenance and Support Requirements

This section lists all the maintenance and support requirements for our product Child-Parent Pairing System. This section includes the information about the code documentation, testing of the product, and maintenance of system.

7.1 Testing

7.1.1 Description

Team AVIAR shall test each module and component of the Child-Parent Pairing System to ensure it is working correctly.

7.1.2 Source

Team AVIAR

7.1.3 Constraints

None

7.1.4 Standards

None

7.1.5 Priority

1 – Critical

7.2 Code Documentation

7.2.1 Description

Team AVIAR shall make sure the code will be well documented with comments and details to make it easier for future development team to modify or fix bugs.
7.2.2 Source

Team AVIAR

7.2.3 Constraints

None

7.2.4 Standards

None

7.2.5 Priority

2 – High

7.3 System Maintenance

7.3.1 Description

Team AVIAR will not be able to provide maintenance after May 2013.

7.3.2 Source

Team AVIAR

7.3.3 Constraints

None

7.3.4 Standards

None

7.3.5 Priority

5 – Future
8. Other Requirements

This section defines additional requirements by the team AVIAR upon the project completion. The requirements were proposed from different consultant’s opinions and project analysis. The requirements include the operated environment, documentation, and standard time format.

8.1 Operating System

8.1.1 Description

The end-user shall provide a computer with a modern operating system.

8.1.2 Source

Team AVIAR

8.1.3 Constraints

The end-user has to know how to our software

8.1.4 Standards

None

8.1.5 Priority

1 – Critical

8.2 Wireless Communication Interface

8.2.1 Description

The installation facility shall be free of wireless interference.

8.2.2 Source

Team AVIAR
8.2.3 Constraints

Signal frequency

8.2.4 Standards

None

8.2.5 Priority

2 – High

8.3 Standard English Documentation

8.3.1 Description

The delivered product to the end-user shall be documented in American English.

8.3.2 Source

Team AVIAR

8.3.3 Constraints

The end-user shall be able to interpret in standard American English

8.3.4 Standards

American English

8.3.5 Priority

3 – Moderate

8.4 Standard US Time Stamp

8.4.1 Description

All time entries in the delivered product shall be formatted as Standard US Time Stamp [hh:mm:ss].

8.4.2 Source

Team AVIAR
8.4.3 Constraints

None

8.4.4 Standards

US Standard Time Stamp

8.4.5 Priority

4 – Low
9. Acceptance Criteria

This section shall be highlighting the acceptance criteria for the Child-Parent Pairing System. These criteria that we came up are for sponsor/customer to review and determine if the requirements are complete.

9.1 Verify that product is safe for children

9.1.1 Requirement(s) Addressed

Requirements 6.1 – 6.4 state that product shall be safe for the children: the product must be created in a way that it is safe for the child to wear it, and it should not hurt the child.

9.1.2 Verification Procedure

The customer will inspect the child unit by putting it on. Additionally, team AVIAR shall provide the instructions and safety measures to take while putting the unit on the child.

9.2 Verify that product is delivered with necessary software and hardware components

9.2.1 Requirement(s) Addressed

Requirement 3.19 states that product shall be delivered with necessary software and hardware: product shall be equipped with a software to install and hardware to connect for the system to work.

9.2.2 Verification Procedure

The customer will install the software and connect the hardware to test the system to test. Additionally, Team AVIAR will be providing the necessary installation manual.

9.3 Verify that Parent/Child information is confidential
9.3.1 Requirement(s) Addressed

Requirements 3.3 – 3.4 state that system is be able to keep parent/child information confidential: the system shall be storing parent/child names in the system and it shall be encrypted in order to keep it confidential.

9.3.2 Verification Procedure

The customer will verify the security measurements in the system that will prevent other people from hacking or stealing confidential data from the system.

9.4 Verify that child shall be alerted automatically from parent’s information

9.4.1 Requirement(s) Addressed

Requirement 3.9 states that child shall be alerted from parent’s information: the system shall identify the child of the parent from the parent’s information. Child will be alerted by vibrating or lighting up the ‘child unit’.

9.4.2 Verification Procedure

The customer will input information from state ID to demonstrate the child notification functionality. This functionality shall notify the child when parent has arrived. Team AVIAR shall provide step by step instructions to use the product.

9.5 Verify that system shall include a card reader

9.5.1 Requirement(s) Addressed

Requirement 3.5 states that system shall include a state ID card reader: the system shall require parent’s information that will be matched to a child unit that child will be wearing.

9.5.2 Verification Procedure

The customer will verify by connecting the state ID reader to the computer. The computer will be used for managing information and testing purposes.

9.6 Verify that system shall include at least 50 child units

9.6.1 Requirement(s) Addressed
Requirement 3.1 states that system shall include at least 50 child units: the system shall be delivered with at least 30 child units or the number of units ordered by the customer.

9.6.2 Verification Procedure

The customer will verify all delivered units by testing them and counting how many were delivered.

9.7 Verify that system shall include a charging rack

9.7.1 Requirement(s) Addressed

Requirement 3.9 states that system shall include a charging rack. The charging rack shall be delivered with the system.

9.7.2 Verification Procedure

The customer will verify the rack charges the unit(s).
10. Use Cases

In this section, the UML use cases for the user-visible features/functions will describe a sequence of actions. Use cases will also describe the scenario with actor’s interaction with the system.

TUCBW stands for This Use Case Begins With
TUCEW stands for This Use Case Ends With

10.1 Registration

10.1.1 Scenario

Clerk registers child-parent pair in the system

10.1.2 Actor(s)

Operator, Parent

10.1.3 TUCBW

Figure 10.1: Use Case - Registration
Parent arrives with the child

10.1.4 TUCEW

Parent is registered in the system

10.2 Child is Picked-Up

10.2.1 Scenario

Child will be notified that parent has arrived

10.2.2 Actor(s)

Parent, Child, Staff Personnel

![Use Case Diagram](image_url)

Figure 10.2: Use Case - Child is Picked-up

10.2.3 TUCBW
10.3 Child is Dropped-off

10.3.1 Scenario

Parent drops-off child

10.3.2 Actor(s)

Parent, Child, Staff Personnel

10.3.3 TUCBW

Parent arrives with the child

10.4.4 TUCEW
Child is put into day-care

10.4 Staff Personnel Activate Child Unit

10.4.1 Scenario

Staff personnel activates child unit

10.4.2 Actor(s)

Staff personnel

![Diagram of Staff Personnel and Child-Parent Pairing Software](image)

Figure 10.3: Use Case - Staff Personnel Activate Child Unit

10.4.3 TUCBW

Staff personnel use the system to activate child unit

10.4.4 TUCEW

Child unit is activated to put on the child
10.5 **Staff Personnel Manages Child-parent Information**

10.5.1 Scenario

Staff personnel manages the system

10.5.2 Actor(s)

Staff personnel

![Diagram](image)

**Figure 10.4: Use Case - Staff Personnel Manages Child-parent Information**

10.5.3 TUCBW

Staff personnel use the system to manage information.

10.5.4 TUCEW

Staff personnel edits/adds/removes information from the system
10.6 Staff Personnel Stores Child-parent Information

10.6.1 Scenario

Staff personnel stores child-parent information in the system

10.6.2 Actor(s)

Staff personnel

10.6.3 TUCBW

Staff personnel receives information from the parent

10.6.4 TUCEW

Staff personnel add the given information into database
11. Feasibility Assessment

Here we will discuss the feasibility of the Child-Parent Pairing System from several different aspects. Our intention is to document and inform stakeholders as to the likelihood of a successful project at the time of completion. We have attempted to be as insightful as possible regarding possible future risks, but of course it is impossible to have impervious foresight. Following are sections on: An analysis of the project scope; the research we have already completed and still have yet to perform; an analysis of the technical structure, requirements, and potential architecture; an analysis of known costs; and an analysis of schedule and time requirements.

11.1 Scope Analysis

The scope of work for all critical requirements is reasonable, and prototyping of these by the deadline date appears feasible. This assessment is based on our research, discussions with our sponsor, technical skills that our team members are confident of, and analysis of three previous CSE Senior Design projects that incorporated similar components and concepts as ours. We expect that two requirements will comprise the bulk of the work scope. These are: 3.15 – base unit and 3.6 – wearable unit. Furthermore, adding all high priority criteria appears to add little to the scope of work, so the probability of completing these is high.

Based on research done for wearable units, radio modules, identification devices, team’s skills in both hardware and software, it has been determined that the bulk of the project is very feasible. Since the critical and high level requirements make up over 75% of the overall requirements for the product, it can be decided that the overall project can be completed. Using schedule analysis it can be determined that the project shall be completed in timely fashion.

The moderate to low level requirements do not add much work to the overall project, but are significant to the quality and completeness of the project.

11.2 Research

Research is a very strong skill that Team AVIAR possesses, and we have already completed research on various topics that have arisen, including: Field research (one of our members has an eight-year old); possible beneficial technologies, more specifically JAVA; and wireless modules with low power consumption.
11.3 Technical Analysis

Modern technology certainly lends itself to a product of this nature, and we don’t see any reason that this project would be stopped because of a lack of technology. In other words, all of the devices, protocols, and systems that we need for implementation already exist in the market. We have also heard that a product similar to ours exists and is available for purchase. To this point, the only technical skills that we have identified as being a deficiency are associated with implementing the card reader and keypad.

11.4 Cost Analysis

Based on the system architecture and required devices, we can certainly build our prototype within a budget of $800.00. A list of the projected cost of required materials will not be provided here, but suffice it to say that the system should fall within our budget.

11.5 Resource Analysis

Our team is made up of two computer engineers, two computer scientists, and a software engineer. Our computer engineers have experience with hardware design and designing circuits; our computer scientists have experience with algorithmic efficiency, and mobile network algorithms; our software engineer has experience with GUI development; and a lot of our team members are cross-trained in these areas and many others as well.

11.6 Schedule Analysis

Our team follows the Function Points as the unit of measurement for schedule analysis. By using Function Points, we can easily calculate the functionality and normalize the results of different parts on the product. The Function Points are calculated from the following formula:

\[ FP = count_{total} \times [0.65 + 0.01 \times \sum F_i] \]

Where:

- \( FP \): Function Points
- \( count_{total} \): A sum of the following measurement parameters:
  - Number of User input \( \times \) Input Weight Value
  - Number of User input \( \times \) Input Weight Value
  - Number of User Inquiries \( \times \) Inquiry Weight Value
  - Number of Files \( \times \) File Weight Value
  - Number of External Interfaces \( \times \) External Interface Weight Value
• Input weight values: Simply, Average and Complex
  ▪ User Inputs: 3, 4, 6
  ▪ User Outputs: 4, 5, 7
  ▪ User Inquiries: 3, 4, 6
  ▪ Files: 7, 10, 15
  ▪ External Interfaces: 5, 7, 10

• $\sum F_i$: Sum of “Complexity Adjustment Values” based on responses of 14 questions. Each question is rated on a scale of 0 – 5:
  ▪ 0: No influence
  ▪ 1: Incidental
  ▪ 2: Moderate
  ▪ 3: Average
  ▪ 4: Significant
  ▪ 5: Essential

Step 1: We compute the total count

<table>
<thead>
<tr>
<th>Measurement Parameter</th>
<th>Count</th>
<th>Weighting Factor</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of User Inputs</td>
<td>4</td>
<td>Simple</td>
<td>12</td>
</tr>
<tr>
<td>Number of User Outputs</td>
<td>4</td>
<td>Average</td>
<td>20</td>
</tr>
<tr>
<td>Number of User Inquiries</td>
<td>2</td>
<td>Simple</td>
<td>6</td>
</tr>
<tr>
<td>Number of Files</td>
<td>4</td>
<td>Simple</td>
<td>28</td>
</tr>
<tr>
<td>Number of External Interfaces</td>
<td>0</td>
<td>Simple</td>
<td>0</td>
</tr>
<tr>
<td>Total Count</td>
<td></td>
<td></td>
<td>66</td>
</tr>
</tbody>
</table>

Table 11.1: The Function Points Total Count

Step 2: We compute the complexity adjustment values by answering 14 questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Does the system require reliable backup and recovery?</td>
<td>Moderate</td>
<td>2</td>
</tr>
<tr>
<td>2  Are data communications required?</td>
<td>Essential</td>
<td>5</td>
</tr>
<tr>
<td>3  Are there distributed processing functions?</td>
<td>No influence</td>
<td>0</td>
</tr>
</tbody>
</table>
### Table 11.2: The complexity Adjustment Values

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Complexity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Is Performance critical?</td>
<td>Average</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Will the system run in an existing heavily utilized operational environment?</td>
<td>Moderate</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Does the system require online data entry?</td>
<td>No Influence</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Does the online data entry require the input transaction to be built over multiple screens or operations?</td>
<td>No Influence</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Are the master files updated online?</td>
<td>No Influence</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Are the inputs, outputs, files, or inquiries complex?</td>
<td>Moderate</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Is the internal processing complex?</td>
<td>Average</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Is the code designed to be reusable?</td>
<td>Average</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Are conversion and installation included in the design?</td>
<td>Significant</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>Is the System designed for multiple installations in different organizations?</td>
<td>No Influence</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>Is the application designed to facilitate change and ease of use by the user?</td>
<td>Significant</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

**Step 3:** Compute the total function point:

\[ FP = 66 \times (0.65 + 0.01 \times 28) = 61.38 \]

Next we compute the maximum hours of effort for the whole team in any given week. The number of hours is based on the team schedule:

- 2 hours on Monday
- 2 hours on Thursday
- 3 hours on Friday
- 4 hours on Saturday

For 5 members: \( 5 \times (2 + 2 + 3 + 4) = 5 \times 10 = 55 \) hours

Likely hours = **50 man-hours a week**
Next, we utilize Jones’s First-Order Schedule Calculation. The equation is: \( FP^x \), where \( x \) is determined by the type of software being developed. In this case, the kind of software is System and the exponent \( x \) is average which is 0.45

\[
FP^x = 66^{0.45} \approx 6.6 \text{ calendar months}
\]

Next, we use COCOMO for estimation of the lines of code necessary which is based on the team member’s experience. With the scale of the project, we estimate that probably the whole program will contains 2000 lines of code.

\[
Effort = 2.94 \times EAF \times (KSLOC)^E = 2.94 \times 1.00 \times (2)^{1.0997} \approx 6.3 \text{ person months}
\]

Finally, we draw a conclusion between person months and calendar months:

<table>
<thead>
<tr>
<th>Function Points</th>
<th>Effort (Person Months)</th>
<th>Schedule (Calendar Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.4</td>
<td>6.6</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Table 11.3: Schedule Analysis
12. Future Items

This section includes the requirements or features/functions that team AVIAR talked about it during the meetings, but unfortunately, these shall not be addressed in the prototype due to constraints of budget, time, skills, technology, or feasibility issues. Future items are listed based on the priority level of all the requirements team AVIAR came up in the earlier section.

12.1 Customer Requirement [3.15]: Check-in with a mobile device

12.1.1 Requirement Description

Base unit shall be used for check-in of the child-parent pair. Another method of check-in team AVIAR had planned was to make it possible for the user/customer to check-in a child with a mobile device. For example, with a mobile device, customer can check-in a child so when parent walks in the child-care facility. When the parent walks in the child-care facility, system shall get information using near field communication (NFC).

12.1.2 Constraint

This feature of letting users check-in with a mobile device is a gold-plating. Time is the constraints for the feature because of the schedule of creating an application or web interface for user to use and getting the NFC system to work properly and secure enough.

12.2 Customer Requirement [3.23]: Visually Appealing

12.2.1 Requirement Description

The wearable unit shall be visually appealing. Team AVIAR was planning to create this unit with a small screen that would be able to display pictures or small message for the older children to notify.

12.2.2 Constraint
A display for the unit shall require better battery and more components to the wrist unit. The final product will become heavier. Time will also be a constraint because team AVIAR has other important components and priority tasks to the main system.