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Lift Case
Stakeholder Requests

Version 1.1

Revision History

Date	Version	Description	Author
27-05-00	1.0	Adapted from inception	Onno van Roosmalen
13-06-00	1.1	Minor textual changes	Onno van Roosmalen

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Stakeholder Requests

1. Introduction

Great opportunities exist in our industry to improve application development efforts. Understanding stakeholder or user needs before beginning development is crucial to improving this process.

1.1 Purpose

The purpose of this document is to capture all requests made on the Lift System project, as well as how these requests have been addressed.

1.2 Scope

This document refers only to the Lift System. The Vision document is used as the input source. The result will be used to steer the investigation of actors and use cases.

1.3 Definitions, Acronyms and Abbreviations

*[This subsection should provide the definitions of all terms, acronyms, and abbreviations required to properly interpret the **Stakeholder Requests**. This information may be provided by reference to the project Glossary.]*

1.4 References

[1] Lift Case - Vision document.

1.5 Overview

*[This subsection should describe what the rest of the **Stakeholder Requests** contains and explain how the document is organized.]*

2. Overview of the Product

The lift system consists of 8 lifts and shafts for a hospital building of ten floors.

At each floor (except the top and bottom floors) there are two buttons for requesting lifts, one for going up and one for going down. These are called Lift Request Buttons. Requests can be serviced by any of the eight lifts. Once pressed, the Lift Request Buttons are lit at the back to indicate that a request is pending. When a lift arrives to service the request the button light is switched off and a chime signal is produced to indicate availability of the lift. The Lift Request Buttons are enabled for new lift-requests when the button light is off. If the button is pressed when a lift cage is at a floor and the doors are not completely closed, the chime will sound, the doors will open again and the door closure time is reset (see the paragraph about opening and closing doors).

Each lift cage contains a set of buttons corresponding to the available floors. These are called Floor Request Buttons. Once pressed the Floor Request Buttons will be back-lit to indicate that a request is pending. When the lift arrives at a floor for which a request is pending, the back light of the corresponding button is switched off, the chime inside the cage sounds and the doors open. Again the Floor Request Buttons are enabled for receiving new requests when the back light is off.

Each lift cage has two sliding half doors that match two sliding half doors for that shaft at each floor. At a particular floor these doors will open and close simultaneously, the floor doors being coupled to the cage doors by mechanical means. When the doors open a closure timeout period starts. When this period expires the doors start closing. If an obstruction is detected in the doorway after expiration of the timeout period, the doors open completely and the closure timeout period is restarted. The lift cage can only start moving to another floor when doors are completely closed. In each cage there are two extra buttons for opening and closing the doors. The button for opening the door will cause the doors to open but only when the lift is still at a floor and has not started moving. The door closure timeout period is reset. Pressing the close button will have the same effect as ending the door closure timeout period. The doors start to close but open again if an obstruction is detected.

The floor requests and lift requests are serviced in a way that guarantees optimal transportation of people. Since the criteria for optimal control may change depending on circumstances the allocation of lifts to requests must flexible and adaptive.

3. Usability

3.1 Normal lift usage

Normal lift usage is characterized by safe and smooth operation in a way described above. The system will decide which lift cage will be allocated to a lift request. The maximum waiting time for a lift to arrive after a lift request has been made should be as small as possible.

3.2 High volume transport during visiting hours

Visiting hours are characterized by an extremely high number of users of the lift system. The maximum capacity of the system will be utilized during approximately four hours a day. Safety and throughput are key attributes in this situation.

To get an optimal visitor flow to the different floors a special peak strategy will be used in order to ensure the highest throughput given a particular maximum waiting time for lift requests.

3.3 Patient transport

The transport of patients is characterized by the use of beds, special limits on the acceleration of the lift cages (many patients cannot endure the g-forces that set in during normal use), and immediate availability of a lift cage (e.g. in life threatening situations).

One of the requests is to develop a remote control system. A lift cage can be requested remotely at a particular floor. The system ensures that the lift cage will have no pending floor requests on arrival. There is a given maximum in the waiting time for this service. At the remaining pending requests people are asked through the speaker on the floor not to enter the lift cage. Inside the cage users are asked to exit if they are at their requested floor. The Floor Request Buttons will all be disabled. Only the already pending requests will be indicated with back-lit buttons. Because this feature will be very disruptive for normal users its use will be restricted.

3.4 Emergency situations

Users of the system can stop all normal functioning of a lift cage and its door in case of an emergency. The lift system will still satisfy maximum waiting times for patient transport in case one lift cage is disabled because of an emergency.

3.5 Maintainer usage

Maintenance on the system will frequently degrade the system to fewer lift cages than the maximum available number. The maintenance engineer is always allowed to claim one lift cage for maintenance purposes.

Some of the demands for maintenance are the use of shafts and cages in an extraordinary way: traveling with open doors, slowing down the lift cage at will (including stopping).

Safety and security regulations for hospital transport apply during maintenance for the remaining cages. If the maintenance personnel must claim more than one cage, special regulations for the maintenance of hospital buildings are operative.

4. Reliability

Reliability accounts to a high degree for the entire lift system and is often a combination of hardware and software. The requirements that have a general character are described in 4.1. The deviations are described in the belonging sections.

4.1 Normal lift usage

Due to the nature of the building, its height and the number of beds, a lift system is indispensable. This means that the system must have an operability of 99.9% in a one-year period. In case of malfunction, the system must recover to a lift sub-system that can be used, at the cost of normal throughput and response time. The repair of the system will start within three hours from reporting.

The mean time between failures (MTBF) should be six months for the software and three months for the hardware.

Decisions on the system should be made with safety as highest priority.

4.2 High volume transport during visiting hours

No special reliability requirements, other than mentioned *under normal lift usage*, are considered.

4.3 Patient transport

Even under extreme conditions patient transport must be possible. This can even lead to the unavailability of the system for normal use.

4.4 Maintainer usage

The system must be designed in such a way that motor control is possible with degraded or no computer support. Where possible the computer should inform the maintenance engineer about the system.

4.5 Strategy definition

5. Performance

5.1 Normal lift usage

In normal use the system should strive for optimum performance. The performance is measured in waiting time.

If the system is in full operation a lift will arrive within 30 seconds in 90% of the requests. The average waiting time should be less than 20 seconds. The maximum waiting time should be 60 seconds.

Lift and floor doors close automatically after 20 seconds (closure timeout period). Completely opening or closing of the doors takes 4 seconds.

The maximum speed of the lift is 4 m/s (both directions)

The maximum acceleration (deceleration) is 5 m/s^2 (both directions).

5.2 High volume transport during visiting hours

During visiting hours the performance of the system is measured in throughput. The expected average number of visitors (1400 for the fully-grown hospital) should be moved in less than 30 minutes. This figure is based upon non-disturbance of other use (e.g. maintenance, patient transport).

5.3 Patient transport

The performance of the system during patient transport is measured in response time and smoothness of operation.

The response time of the lift should be less than 30 seconds under normal working conditions.

The acceleration of the lift cage is reduced to 1 m/s^2 in order to diminish the g-forces on the patient.

5.4 Maintainer usage

In maintenance mode no performance is measured.

5.5 Strategy definition

6. Supportability

Due to the nature of this software product, the application of the latest research results, it is of the highest importance to pay attention to the following quality attributes:

- testability
- extensibility
- adaptability
- maintainability
- compatibility
- serviceability

It is expected that during the actual use of the lift system, the software will evolve to incorporate the experience from using the system. This implies that the software must be accessible for changes, additions, adaptations, et cetera. Therefor, the structure of the software must crisp and clear, and well documented.

Regulations from the standardization bodies with respect to hospitals & clinics demand a certain validation and verification level. For this reason, testability is one of the important attributes.

7. Business Rules and Regulations

ISO-9000, hospital sub-standards

GHO, good hospital practices

EHSR, European Hospital Standards and Regulations

8. Technology Rules and Limitations

ISO-9000, Software Development sub-standards

CMM level 3