MCMASTER UNIVERSITY

CAS 4ZP6 CAPSTONE PROJECT 2013/2014

PORTER SIMULATION

Requirements Documentation Revision 0

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February 4, 2014

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1 Revision History

Revision #	Author	Date	Comment
1	Vitaliy Kondratiev, Nathan Johrendt, Tyler Lyn, Mark Gammie	October 28	Info Missing
2	Vitaliy Kondratiev, Nathan Johrendt, Tyler Lyn, Mark Gammie	October 29	Info Missing
3	Vitaliy Kondratiev, Nathan Johrendt, Tyler Lyn, Mark Gammie	October 29	Info Missing
4	Vitaliy Kondratiev, Nathan Johrendt, Tyler Lyn, Mark Gammie	October 30	Info Missing
5	Nathan Johrendt	January 13	Info Update
6	Vitaliy Kondratiev	February 2	Update and Corrections
7	Nathan Johrendt	February 3	Update and Corrections

2 List Of Figures

There are currently no figures within the requirements document, this section will be removed if no figures are added by revision 1.

3 List of Tables

(a) Revision History Table - Section 1 contains a table detailing the revision history of the document.

4 Purpose of the Project

4.1 Template

This requirements document is based on the Volere template, formatted using LaTex.

4.2 Background

Hamilton Health Sciences are experiencing inefficiencies when synchronizing their porter services throughout each of their locations. Porter services, in this context, are defined as the movement of equipment such as beds, wheelchairs, other medical instruments and patient transfers from one location to another. Porters are a key piece of overall patient experience and satisfaction; the flow of day to day operations in a hospital depends on their efficiency. The problem HHS is facing is, synchronization of porter services with the existing constraints (time/money/porter availability/policy compliance). Porters should be able to achieve greater efficiency by minimizing client (patient/doctor/nurse/technician/etc.) wait times and reducing the total time wasted in everyday operations. Hamilton Health Sciences are lacking the tools to solve this problem.

4.3 Goals

Our goal is to provide HHS with the tools to simulate their porter services so that they can test their own solutions, methods and make calculated decisions based on the results.

5 The Stakeholders

Hamilton Health Sciences (HHS) operational management team is the main stakeholder for this project. Names and position are:

Corey Stark (CSS - Sodexo Systems and Performance Manager)
Kym Kempf (Business and Program Manager - Corporate Services)
David DiSimoni (Site Manager - Customer Support Services)
Anita Lamond (Director - Corporate Services)
Steve Metham (Manager - Quality)
Mohammad Majedi (Quality Specialist)
Talha Hussain (Quality Specialist)

5.1 The Client

Hamilton Health Sciences (HHS) operational management team is the client for this project. Names and positions are:

Corey Stark (CSS - Sodexo Systems and Performance Manager)
Kym Kempf (Business and Program Manager - Corporate Services)
David DiSimoni (Site Manager - Customer Support Services)
Anita Lamond (Director - Corporate Services)
Steve Metham (Manager - Quality)
Mohammad Majedi (Quality Specialist)
Talha Hussain (Quality Specialist)

5.2 The Customer

Hamilton Health Sciences (HHS) operational management team is also the customer for this project. Names and positions are:

Corey Stark (CSS - Sodexo Systems and Performance Manager)
Kym Kempf (Business and Program Manager - Corporate Services)
David DiSimoni (Site Manager - Customer Support Services)
Anita Lamond (Director - Corporate Services)
Steve Metham (Manager - Quality)
Mohammad Majedi (Quality Specialist)
Talha Hussain (Quality Specialist)

5.3 Other Stakeholders

Patients and Hospital Staff are the secondary stakeholders for this project. Any benefits that arise from the successful completion of this project will affect these stakeholders.

5.4 Hands on Users

Operational Management Staff will be the primary hands on users of the finished product. Names and positions are:

6 Mandated Constraints

6.1 Solution Constraints

Given that this is a simulation of real-world events at an HHS hospital, the results produced must be accurate and consistent. The exact factor of accuracy required is still in discussion with the stakeholders, but they have provided us with recorded data to aid in constructing a model that is as accurate as possible.

6.2 Schedule Constraints

Simulation Software must be complete and requirements met by the end of March 2014. (Current Academic Year)

7 Naming Conventions and Technology

7.1 Definitions of All Terms, Including Acronyms, Used by Stakeholders involved in the Project

(a) **HHS:** Hamilton Health Sciences

(b) **IVR:** Interactive Voice Request - phone system for requesting porter services

(c) **Porter:** Staff member responsible for movement of equipment such as beds, wheelchairs, other medical instruments and patient transfers from one location to another

  (i) **Off-System Porter:** Porters that follow a strict scheduled and a predetermined set of activities

  (ii) **On-System Porter:** Porters that respond to ad-hoc and pre-booked requests

(d) **Dispatching System:** An automated software system responsible for receiving and assigning requests to Porters

(e) **Zoom Stretcher:** A powered stretcher used for patient transportation

(f) **Standard Equipment:** Non-powered stretchers, beds, wheelchairs

(g) **Priority of Requests:** Requests placed by Hospital Staff can be prioritized on a scale from 0 - 9 with 0 being the most urgent. Porters can place an Assist Call that has a higher priority than 0.

(h) **Event State:** A state of the porter service event as dictated by the Dispatching System

  (i) **Pending:** Job has been placed in the system queue

  (ii) **Dispatched:** Job has been matched to an available porter

  (iii) **In-Progress:** Job is being executed by the porter

  (iv) **Complete:** Job has been completed

  (v) **Dispatch Delay:** Porter states that he/she is delayed during a Dispatched event

  (vi) **In-Progress Delay:** Porter states that he/she is delayed during a In-Progress

(i) **Transaction Time:** the time from Event State (Pending) to Event State (Complete)

(j) **Proactive Page:** A porter pages the request location to inform the requester of his/her impending arrival

(k) **Age of Request:** How long a job has been pending in the dispatch system do not receive any calls from the dispatch system

(l) **CSV file:** Comma Separated Values file, stores tabular data in plain text form.

(m) **GUI:** Graphical User Interface - interaction with electronic devices through graphical icons and visual indicators

8 Relevant Facts and Assumptions

8.1 Relevant Facts

(a) HHS will provide the project team with available non critical data

(b) HHS currently uses a Dispatching System to route its porters to desired locations

(c) On certain route segments, two porters are required to transport the patient

(d) HHS will provide personnel and hours for testing of the application

8.2 Business Rules

(a) Under their collective agreement a porter cannot be scheduled for less than an X amount of hours per week and X amount of hours per shift

(b) Each request has six event states (Pending, Dispatch, In-Progress, Complete, Dispatch Delay, In-Progress Delay)

(c) Requests are prioritized on a 0 - 9 scale

(d) There are three types of transportation equipment (Non-Powered Stretcher, Zoom Stretcher, Wheelchair, Bed)

(e) There are two types of porters (On-System, Off-System)

(f) Every completed event has an associated transaction time, unless cancelled

(g) Dispatch System determines the assignment of requests by using these parameters (Priority, Proximity, Pre-Scheduled Appointment Use, Age of Request)

(h) Industry standard for patient transport transaction time is 30 minutes

(i) Porter service requests can be made using any hospital computer or phone (IVR)

(j) Porters can be "zoned" into system item requests by the dispatching system

8.3 Assumptions

(a) Every porter is equally capable of performing every task as every other porter

(b) All transporting equipment is in equal physical condition as other equipment of the same type

(c) Wheel Chair transport of patients is four to five minutes less in transaction time

(d) Some of the porters use proactive paging

(e) The majority of service requests are made through hospital computers

9 Scope of the Work

9.1 Current Situation

Hamilton Health Sciences are experiencing inefficiencies when synchronizing their porter services throughout each of their locations and are lacking the tools to solve this problem. The biggest problem comes from the lack of compliance and coordination of the many separate entities of the hospital body. The porters are currently being scheduled by an online dispatching system, which also tracks their progress. Although the system is very efficient at how it completes it's dispatching, it has no insight or analysis capabilities to support daily operations.

9.2 Context of the Work

HHS requires a tool to support their daily operations and decision making. The tool is to provide the stakeholders with the data and insight to complete their objectives.

9.3 Business Use Case

The simulation tool will be used by members of the operational management staff to model their process as per their variables and the simulation constraints.

10 Scope of the Product

10.1 Product Boundary

(a) The simulation tool will not model the 100% full hospital environment

(b) The simulation will only consider the On-System Porters

(c) Not all porter activities will be simulated. Simulation will concentrate on the 6 event states tracked by the dispatching system (Pending, Dispatch, In-Progress, Complete, Dispatch Delay, In-Progress Delay).

10.2 Product Use Cases

(a) Operational Manager has a new initiative they want to implement into everyday operation. He/She uses the simulation by changing the adjustable variables with his/her own values and executing it. He/She analyses the output of the simulation and determines if the new initiative should be implemented.

(b) Operational Manager has to determine how to modify the schedule for the porter service staff. He/She uses the simulation by changing the adjustable variables with his/her own values and executing it. He/She uses the output to design/refine the new schedule.

(c) Operational Manager wants to increase operational compliance of some particular policy. He/She uses the simulation by changing the adjustable variables related to a certain level of compliance with his/her own values and executing it. Once positive results have been verified he/she shows the results to all the parties involved in the compliance policy to effectively increase compliance.

(d) Operational Manager wants to experiment with theoretical scenarios. He/She uses the simulation by changing the adjustable variables with his/her own values and executing it. He/She analyses the output data and either creates a new initiative based on result or archives the data.

11 Functional Requirements

11.1 Functional Requirements

1. **Description:** Simulation must take a file as input. This file contains data logs from the dispatching system concerning past porter events
   Rationale: Operational Management staff has indicated that using a file as input is the preferred method
   Fit Criterion: Simulation must accept the file without error 100% of the time

2. **Description:** A series of simulation variables that affect the simulation output must be editable by the user
   Rationale: Operational Management staff must be able to modify the simulation
   Fit Criterion: Simulation must include the following variables
   (i) Number of Porters
   (ii) Start Date of Data Input
   (iii) End Date of Data Input
   (iv) Event Distribution Type
   (v) Event Intensity
   (vi) Compliance (Equipment Usage)
   (vii) Compliance (Patient Readiness)
   (viii) Compliance (Porter Wait Times)

3. **Description:** Simulation Tool must be able to run a pre-designed model incorporating the given input variables and exit
   Rationale: Operational Staff must be able to run the simulation
   Fit Criterion: Simulation must be accurate within X range of accuracy

4. **Description** The output of the simulation must be relevant data
   Rationale: Data must be relevant for the Operational Management's business process
   Fit Criterion: The output must be 100% relevant in the scope of the problem

5. **Description** The output of the simulation must be a file
   Rationale: A file can be analysed for data manually or used as input for other software
   Fit Criterion: The output file must be have 0% errors according to the file type standards

12 Look and Feel Requirements

12.1 Appearance Requirements

Appearance Requirements are still in the discussion stage with the stakeholders. Stakeholders prefer a specific color scheme that complies with the rest of their software. They have expressed a desire to see some graphical interpretation of simulated results, but details are still being discussed.

12.2 Style Requirements

1. Software must contain elements of basic human/computer interface design as expected by a casual user of personal computers and popular software/operating systems. The exact details will be worked out after further discussion with the end users.

13 Usability and Humanity Requirements

13.1 Ease of Use Requirements

1. **Content:** Software must have a GUI
   Motivation: Users of this software are not assumed to be advanced computer users. Users are not expected to know how to use command line or similar interfaces.
   Fit Criterion: All basic functions of the software are accessible through a GUI
   Considerations: This Ease of Use requirement considers all of the Product Use Cases

2. **Content:** The GUI must have checks in place to prevent the user from using invalid inputs
   Motivation: All inputs must comply with the arguments of the execution program
   Fit Criterion: GUI restricts the user to a predetermined set of inputs
   Considerations: This Ease of Use requirement considers all of the Product Use Cases

3. **Content:** Software must be easy to navigate
   Motivation: Users should be able to easily move between different screens
   Fit Criterion: Each screen is linked to each other with an easily accessible interface feature
   Considerations: This Ease of Use requirement considers all of the Product Use Cases

4. **Content:** User must clearly understand all the functions with minimal training
   Motivation: User should be able to pick up the functionality based on the context
   Fit Criterion: All elements of GUI should will be easy to understand under context of the usability
   Consideration: This Ease of Use requirement considers all of the Product Use Cases

13.2 Personalization and Internationalization Requirements

Personalization of the final product will be discussed with stakeholders and end users once further development has occurred. Internationalization requirements are not applicable.

13.3 Learning Requirements

1. **Content:** Software must be easy to learn with some hands-on training and documentation by a casual user of personal computers
   Motivation: Users are not required to have any knowledge of simulation software to operate the product
   Fit Criterion: Users will be able to use the software after a few training sessions of less than sixty minutes
   Consideration: This Learning requirement considers all of the Product Use Cases

13.4 Understandability and Politeness Requirements

1. **Content:** Users should be able to quickly understand how the software will benefit them in their business process
   Motivation: Users are not expected to understand aspects that do not directly relate to their purpose
   Fit Criterion: All of the simulated aspects will be related to the user's business problems unless the case considered is far out of the problem scope stated in these requirements
   Consideration: This Understandability requirement considers all of the Product Use Cases

13.5 Accessibility Requirements

Currently there have been no Accessibility Requirements from the stakeholders.

14 Performance Requirements

14.1 Speed and Latency Requirements

1. **Content:** Software must be able to complete the simulation as set up by the user within a reasonable time
   Motivation: As per request by the stakeholders
   Fit Criterion: A single simulation should not take more than a working day (12h) to complete
   Considerations: This speed requirement considers all of the Product Use Cases

14.2 Safety-Critical Requirements

Currently there have been no Safety-Critical Requirements proposed by the stakeholders.

14.3 Precision or Accuracy Requirements

Precision and Accuracy requirements are subject to change during the course of the project. Simulation must be accurate within a certain range. To be decided at a later date.

14.4 Reliability and Availability Requirements

1. **Content:** Software must output relevant data to the user without error
   Motivation: Users should expect the output to be useful in their business process
   Fit Criterion: Output will be in correct format as per Functional Requirement # 4
   Considerations: This reliability requirement considers all of the Product Use Cases

2. **Content:** Software must be available to the user at all times except when a simulation is running
   Motivation: Users should be able to access and use the software at any point in time
   Fit Criterion: Software is available to use 100% of the time other than when the simulation is executing
   Considerations: This availability requirement considers all of the Product Use Cases

14.5 Robustness or Fault-Tolerance Requirements

1. **Content:** Software must not crash during the simulation process if the simulation is running within the scope of the project
   Motivation: Users should expect most simulations to complete without error
   Fit Criterion: The simulation should not fail 99% of the time
   Considerations: This robustness requirement considers all of the Product Use Cases

14.6 Capacity Requirements

Capacity Requirements are still in the discussion stage with the stakeholders.

14.7 Scalability or Extensibility Requirements

Scalability and Extensibility Requirements are still in the discussion stage with the stakeholders.

14.8 Longevity Requirements

Longevity Requirements are still in the discussion stage with the stakeholders.

15 Operational and Environmental Requirements

15.1 Expected Physical Environment

Software on a computer station in a HHS employee's office.

15.2 Requirements for Interfacing with Adjacent Systems

Not Applicable.

15.3 Productization Requirements

Not Applicable.

15.4 Release Requirements

Final version of simulation software should be made available by April 1st 2014.

16 Maintainability and Support Requirements

16.1 Maintenance Requirements

1. The Project Team will provide maintenance to the software up to the projected project finish date (April 1st 2014)

16.2 Supportability Requirements

1. The Project Team will provide support for the software up to the projected project finish date (April 1st 2014)

16.3 Adaptability Requirements

The simulation is being modelled after existing data provided by stakeholders, with the possibility of modifying the software later to accommodate updated base values.

17 Security Requirements

17.1 Access Requirements

1. Software will be accessible to any user who has access to the system the software resides on

17.2 Integrity Requirements

Not Applicable.

17.3 Privacy Requirements

Confidentiality waivers are required for project members to participate in on-site visits to HHS locations during simulation development.

17.4 Audit Requirements

Not Applicable.

17.5 Immunity Requirements

Not Applicable.

18 Cultural Requirements

18.1 Cultural Requirements

Not Applicable.

19 Legal Requirements

19.1 Compliance Requirements

Not Applicable.

19.2 Standards Requirements

Not Applicable.

20 Off-the-Shelf Solutions

20.1 Ready-Made Products

Visual8 produces visual process modelling simulations and have worked with HHS on past projects.

20.2 Reusable Components

Simulation model should be adaptable to other HHS locations utilizing on-system porter services.

20.3 Products That Can Be Copied

None found that are applicable and freely available to duplicate.

21 New Problems

21.1 Effects on the Current Environment

Only when the product simulates positive beneficial results consistently will stakeholders consider implementing modifications to the existing HHS environment.

21.2 Effects on the Installed Systems

The product will have 0% effect on installed systems or other software.

21.3 Potential User Problems

None applicable yet, to be determined.

21.4 Limitations in the Anticipated Implementation Environment That May Inhibit the New Product

The simulation software should only be executed on systems that meet the previously stated Performance Requirements.

21.5 Follow-Up Problems

Should major changes in HHS operational protocol occur in the future, aspects of the simulation will likely require modification to continue producing accurate results.

22 Tasks

22.1 Academic Milestones

(a) **Record of Proposed Project** - due September 20th, 2013

(b) **Problem Statement** - due September 24th, 2013

(c) **Requirements Document Revision 0** - due October 10th, 2013

(d) **Test Plan Revision 0** - due October 24th, 2013

(e) **Proof of Concept Presentation** - to be complete between November 11th, 2013 and November 22nd, 2013

(f) **Design Documentation Revision 0** - due January 14th, 2014

(g) **Revision 0 Demonstration** - to be completed between January 27th, 2014 and February 7th, 2014

(h) **User Guide Revision 0** - due February 18th, 2014

(i) **Test Report Revision 0** - due March 4th, 2014

(j) **Final Demonstration Revision 1** - due March 29th, 2014

(k) **Final Documentation Revision 1** - due April 1st, 2014

22.2 Stakeholder Milestones

(a) **Deliver first demo to HHS representatives** - due February 4th, 2014

(b) **Deliver second demo of the product to HHS staff** - due March 21st, 2014

(c) **Lead usability tests with users of the product** - due March 28th, 2014

(d) **Provide final project report + design documentation + user manual + Final Demonstration** - due April 18st, 2014

(e) **Install final version of software on department computers** - due April 18st, 2014

23 Risks

(a) Simulation gives false data leading to wrong decisions by the Operational Management Team

(b) Simulation is used as not intended/ out of scope leading to wrong decisions by the Operational Management Team

(c) Simulation does not help with decision making process of the Operational Management Team

24 Costs

There are currently no financial costs associated with this project.

25 User Documentation and Training

25.1 User Documentation Requirements

The users of this software will be provided with detailed documentation outlining the framework, functionality, and usability. Details of this document are to be decided on at a later date.

25.2 Training Requirements

The users will be provided with hands-on training and training material by the project team. The details of this material are to be decided at a later date.

26 Open Issues

1. Continue to narrow down complete variable list.
2. Clearly define which tasks on/off system porters complete.
3. Establish specific precision and accuracy requirements.
4. Establish User Documentation Requirements.
5. Establish Training Material Requirements.
6. Establish Potential User Problems.
7. Establish Stakeholder milestones as well as project plan.
8. Establish Scalability and Extensibility requirements.
9. Establish Longevity Requirements.
10. Establish Capacity Requirements.
11. Establish Personalization and Internalization requirements.
12. Establish Appearance Requirements.

27 Waiting Room

Currently empty.