MCMASTER UNIVERSITY

CAS 4ZP6 CAPSTONE PROJECT 2013/2014

PORTER SIMULATION

Requirements Documentation Revision 0

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1 PURPOSE OF THE PROJECT

1.1 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. 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.

1.2 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.

2 THE STAKEHOLDERS

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

2.1 THE CLIENT

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

2.2 THE CUSTOMER

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

2.3 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.

2.4 Hands on Users

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

3 Mandated Constraints

3.1 Solution Constraints

Currently there are no solution constraints as per discussion with the stakeholders.

3.2 Schedule Constraints

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

4 Naming Conventions and Technology

4.1 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

  (i) **RDE:** Remote Dispatching E... - portal used to view the current state of all the porter jobs currently in the Dispatching System

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

(f) **Pneumatic Tube:** A transportation system for lab samples and specimens

(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 event

(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

(l) **Break3:** A state a porter can enter where they are still logged into the system but do not receive any calls from the dispatch system

(m) **Zoned:** A term for a porter that only receives certain types of requests as specified by the dispatching system

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

(o) **System Item Request:** requests that deal with specimens/blood/bed movement/etc ...

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

5 Relevant Facts and Assumptions

5.1 Relevant Facts

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

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

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

(d) Lab/Specimen delivery use Off-System Porters on weekdays from 8:00 to 16:00

5.2 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 (Stretcher, Zoom Stretcher, Wheelchair)

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

(f) Every completed event has an associated transaction time

(g) Only Off-System porters can be scheduled for pre-booked requests

(h) Juravinski uses the Pneumatic Tube for 40% of the lab deliveries and porters for 60%

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

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

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

(l) Porters can enter into an unscheduled break mode (Break3) where they do not receive any requests from the dispatch system

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

5.3 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 porters use proactive paging

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

(f) Porters do not abuse the "Break3" mode

6 Scope of the Work

6.1 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.

6.2 Context of the Work

The context of the work is to provide HHS with a simulation that models their porter services. The simulation is not to provide a solution but act as a tool to test new operational ideas.

6.3 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.

7 Scope of the Product

7.1 Product Boundary

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

(b) The simulation will focus on 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).

(d) The simulation tool will only model the Juravinski Hospital location

7.2 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.

8 FUNCTIONAL REQUIREMENTS

8.1 FUNCTIONAL REQUIREMENTS

(a) **Description:** Simulation must use a CSV file type as input
Rationale: Operational Management staff has indicated that using the CSV file type as the input is the preferred option
Originator: Operational Management staff
Fit Criterion: Simulation must accept the CSV File type without error 100% of the time assuming the CSV file is without error

(b) **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 at least 85% of the following variables

(i) Number of Porters

(ii) Frequency of Events

(iii) Number of Locations

(iv) To be decided ...

(c) **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

(d) **Description** The output of the simulation must be a CSV file type
Rationale: It is best design to use the same file type for output as input
Fit Criterion: The output file must be have 0% errors according to the CSV file type standards

9 Look and Feel Requirements

9.1 Appearance Requirements

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

9.2 Style Requirements

(a) 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.

10 Usability and Humanity Requirements

10.1 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:** Software must be able to undo actions
   Motivation: As per the familiarity requirements the software must mimic some of the main functions of popular software
   Fit Criterion: All basic actions completed in the GUI will be able to be undone up to a certain point (to be decided)
   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

10.2 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.

10.3 Learning Requirements

(a) **Content:** Software must be easy to learn with some hands-on training and reading training 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

10.4 Understandability and Politeness Requirements

(b) **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

10.5 Accessibility Requirements

Currently there have been no Accessibility Requirements from the stakeholders.

11 Performance Requirements

11.1 Speed and Latency Requirements

(a) **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

11.2 Safety-Critical Requirements

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

11.3 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.

11.4 Reliability and Availability Requirements

(a) **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

(b) **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

11.5 Robustness or Fault-Tolerance Requirements

(a) **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

11.6 Capacity Requirements

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

11.7 Scalability or Extensibility Requirements

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

11.8 Longevity Requirements

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

12 Operational and Environmental Requirements

12.1 Expected Physical Environment

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

12.2 Requirements for Interfacing with Adjacent Systems

Not Applicable.

12.3 Productization Requirements

Not Applicable.

12.4 Release Requirements

Final version of simulation software should be made available by March 2014.

13 Maintainability and Support Requirements

13.1 Maintenance Requirements

(a) The Project Team will provide maintenance to the software up to the projected project finish date (March 2014)

13.2 Supportability Requirements

(a) The Project Team will provide support for the software up to the projected project finish date (March 2014)

13.3 Adaptability Requirements

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

14 Security Requirements

14.1 Access Requirements

(a) Software will be accessible to any user who has access to the system the software resides on

14.2 Integrity Requirements

Not Applicable.

14.3 Privacy Requirements

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

14.4 Audit Requirements

Not Applicable.

14.5 Immunity Requirements

Not Applicable.

15 Cultural Requirements

15.1 Cultural Requirements

Not Applicable.

16 Legal Requirements

16.1 Compliance Requirements

Not Applicable.

16.2 Standards Requirements

Not Applicable.

17 Off-the-Shelf Solutions

17.1 Ready-Made Products

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

17.2 Reusable Components

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

17.3 Products That Can Be Copied

None found that are applicable and freely available to duplicate.

18 New Problems

18.1 Effects on the Current Environment

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

18.2 Effects on the Installed Systems

The product should have no effect on installed systems or other software.

18.3 Potential User Problems

None applicable yet, to be determined.

18.4 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.

18.5 Follow-Up Problems

None applicable yet, to be determined.

19 Tasks

19.1 Project Planning

19.2 Planning of the Development Phases

20 Risks

21 Costs

There are currently no financial costs associated with this project.

22 User Documentation and Training

22.1 User Documentation Requirements

22.2 Training Requirements

23 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.

24 Waiting Room

25 Ideas for Solutions