



February 19, 2007
Mr. Lakshman One
School of Engineering Science
Simon Fraser University
Burnaby, British Columbia
V5A 1S6

Re: ENSC 440/305 Functional Specification for an Automated Cocktail Maker

Dear Mr. One,

Enclosed please find a copy of the functional specification for an automated cocktail maker by Simple Sophisticated Technologies. The attached document outlines the requirements for SST's proposed device. The company's primary objective is to implement an automated cocktail maker device that prepares predefined cocktails at a touch of a button.

The accompanying document provides functional details and feature specifications of the automated cocktail maker. The stated functions which are related to proof-of-concept phase are to be completed by April 2007 and the production version to be developed thereof.

SST's dedicated, talented and motivated team of senior engineering students is comprised of Behzad Behroozan, Mana Hamidi, Sara Hezarkhani, Alireza Nematollahi and Sara Moghaddamjoo. For further information or any concern you may have please do not hesitate to contact me by phone at (778) 883-2424 or by email at project-ensc440@sfu.ca.

Sincerely,



Sara Moghaddamjoo
President and CEO
Simple Sophisticated Technologies Inc.
<http://www.sstechnologies.ca>



Simple Sophisticated Technologies™

Saaghy™, The ultimate art of perfect cocktail

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Saaghy™, Automated Cocktail Maker Functional Specifications

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Executive Summery

21st century is about technology and speed. Devices are engineered to help people's need in every aspects of everyday life, from a small coffee maker to the complicated computers. Simple Sophisticated Technologies has considered a new idea in designing a device to accommodate cocktail making in any environment. The quality of the drink will be the same no matter how many drinks are made. Also the user can use this device instead of hiring a bartender at a party or even bartenders can use this device to speed up their work.

Simple Sophisticated Technologies has planed to accomplish its goals in two phases. For the first Phase, it is required to accomplish proof of concept which contains the following parts:

1. Controlling fluid flow through a valve.
2. Mixing 2 fluids using valves.
3. Shaking the desired mix.
4. Pouring the drink into a glass.
5. Using the appropriate user interface to choose the desired drinks.

Once the proof of concept is completed, and the system has been fully controlled, it will be possible to add more features to improve the device to be more user-friendly and practical. These improvements include:

1. Adding more choices for drinks.
2. Rotating the disk that contains different fluids.
3. Cleaning features for the whole system.
4. Designing custom made fluid containers.
5. Designing a shaker with an opening for ice.
6. Adding an LCD to the user interface.
7. Making the device user programmable.

The Simple Sophisticated Technologies group has planned to finish the first phase by the beginning of April 2007.



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Introduction

Saaghy™ is an automated cocktail maker which uses innovative methods for mixing, shaking and cleaning to make serving drinks easier. In order to prepare the user's desired drink; the device will select the required amount from each ingredient and pours them into the shaker. The shaker will mix the ingredients thoroughly in several vertical movements and the drink will be poured into the glass. The device has three cleaning cycles in order to always keep the environment hygienic for the drink making process.

The development of Saaghy™ happens in two stages. The first stage comprises the completion of a proof-of-concept device aimed to be achieved by the beginning of April 2007. The second stage is the development of the final design for the commercial rationale expected to be finalized by April 2008.

Scope

The scope of this document covers the requirements and functionalities which need to be standardized for both the proof-of-concept and the final commercial product. Requirements for production may change as more product survey feedbacks are collected during the prototype design. The mentioned functional requirements represent the current customer's demand from the product. After thorough market studies and testing of the concept, the final modification of the device will be prepared for the production.

Glossary

FAQ	Frequently Asked Questions
UI	User Interface
SST	Simple Sophisticated Technologies
LED	Light Emitting Diode
LCD	Liquid Crystal Display
CD	Compact Disk
FDA	Food and Drug Administration



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Intended Audience

The main purpose of this document is to act as a guideline to help the engineers in design, integration and quality assurance of Saaghy™. SST’s executives and vice presidents can also use the functional specification document as a checklist to ensure that the development process is inline and to control and to direct the progress toward the end according to the user’s expectations from the device. Another intended purpose of this document is to provide a reference to product features for future marketing phase of development.

Convention

The following notation is used throughout this document in order to illustrate each functional requirement:

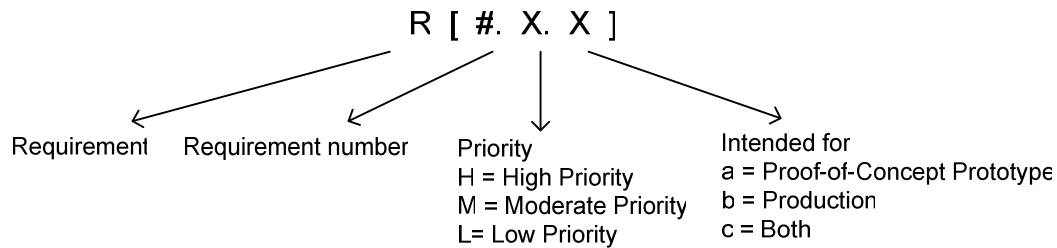


Figure 1: Conventions Used Throughout Functional Specification

By the mid March 2007 the high priority requirements are must haves. For the project final demo, the medium priority requirements are should haves, and the low priority requirements are may haves. The requirements that are intended for proof of concept are to be done by beginning of April 2007.

System Requirements

System Overview

A general system overview for Saaghy™ is shown in Figure 1. Once the user selects the desired drink, the system starts by choosing the right ingredients' bottles and pours the specific amount using the fluid dispenser into the shaking chamber. The shaking chamber then shakes the drinks and pours the output drink into the glass.

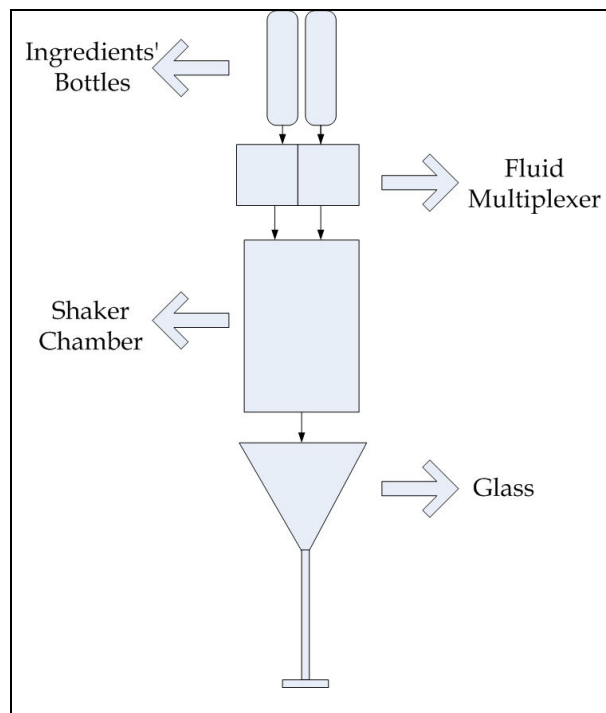


Figure 2: Saaghy™ System Overview

General Requirements

In order to use Saaghy™ as a home appliance the device should meet some general requirements. As a general requirement the device should be functional in different environment. Presence of the ice in the process of drink making emphasizes the importance of the functionality under low temperatures. Also, use of alcoholic liquids as ingredients requires the device to be chemically resistant. Moreover, the presence of liquids suggests precise isolation. More detailed general requirements are listed bellow:



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- R [1, H, c] The device shall operate under normal temperature range of -20°C to 60°C.
- R [2, H, c] Different parts of the device shall have high chemical stability to avoid any toxic contamination.
- R [3, H, c] The device shall be water resistant.
- R [4, H, c] The weight of the device shall not exceed 6-8 kg.
- R [5, H, c] The device shall operate with minimum amount of vibration.
- R [6, H, c] All the joints in the device shall have proper sealing to avoid leakage.
- R [7, H, c] All the moving parts shall have appropriate treatment to avoid rubbing and grinding.
- R [8, H, c] The system shall be able to operate under long periods of time.
- R [9, H, c] The system shall report any errors encountered.
- R [10, H, b] Energy guide labels shall be placed on the device according to the third part of the Canada's Energy Efficiency Act.

Performance

The following requirements are in accordance with the overall expected performance of the device in order to maximize usability.

- R [11, L, c] The device shall be able to mix as many as eight different ingredients together.
- R [12, L, c] The device shall be able to produce as many as twenty different drink combinations with the ingredients.
- R [13, H, c] The response delay between the time that the user chooses a drink and the time the device starts producing the drink shall be under 500 milliseconds.
- R [14, L, c] The device shall be able to go to sleep mode after two minutes of inactivity to conserve power.



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- R [15, L, b]** The fluid dispensing system shall be accurate to within $\pm 5\%$ of the liquid container's volume.

Reliability and Serviceability

Saaghy™ is following two main goals to offer quality drinks to individuals. The first goal is to provide a clean and non-toxic drink with unbeatable quality. The second goal on the list is to speed up the process while keeping the quality the same.

- R [16, H, c]** The drink shall be safe and non-toxic.
- R [17, H, c]** Device shall be capable of precise ingredient measurement.
- R [18, L, b]** The device shall be able to produce a drink in less than one minute.

Compatibility

The main compatibility concerns are the power supply system, and food-contact surfaces of the device.

- R [19, H, c]** System Power Supply shall be stable and well-designed to avoid producing shock to the users.
- R [20, H, c]** Power Supply shall be compatible with the North American hydro system.
- R [21, H, c]** Power Supply shall be smart enough to deal with sudden variations in the electrical power.
- R [22, H, c]** Power Supply shall be isolated from the rest of the device.
- R [23, H, c]** Food-contact surfaces shall follow the FDA regulations for food safety.
- R [24, H, c]** Dimensions of the device shall be compatible with almost all kitchen counters and other home appliances.



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Safety and Energy efficiency Requirements

Following safety rules and regulations along with FDA regulations are required to be considered in producing Saaghy™. Some of these rules are as follow:

- R [25, H, c]** All the electrical parts of the device shall have proper isolation.
- R [26, H, c]** The food-touching surfaces of the device shall be cleaned after each drink is served to avoid contamination of the new drinks.
- R [27, H, c]** All moving parts of the device shall be leak-proof to avoid corrosion and contaminations.

Functional Requirements

Functional Parts

Requirements for the liquid dispenser are defined in terms of the capability to control the flow of liquids from containers to the shaking chamber as well as the capability of precisely controlling the amount of liquid dispensed.

Liquid Dispenser

Liquid Dispenser controls the amount of ingredient liquid for each mix; therefore it needs to be highly accurate and controllable.

- R [28, H, c]** Liquid valve will be used to control the flow of each drink separately.
- R [29, H, c]** The valves will be normally closed in order to control the flow by opening the valves.
- R [30, H, c]** Two-way valves will be used in order to avoid leakage.
- R [31, H, c]** Ambient temperature should be between -20 to +60 °C



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- R [32, H, c] The valve voltage should be between 12 VDC, 15 VDC, or 24 VDC to be safe and easy to convert from other DC or AC voltages.
- R [33, M, c] The operating pressure should be between 0 to 550 [psi] to have enough pressure to pass the defined amount of a liquid.
- R [34, M, c] The pipe size of the valve can be 1/4" or 1/8" which are the standard sizes for the valves.
- R [35, M, c] The material of the construction of the valve should be stainless steel to be safe for alcohol.
- R [36, M, c] Coil wattage should be from 4 to 14 [w] to be powerful enough to keep the valve close.
- R [37, M, c] the orifice size should be 1/4" or 1/8" to make the flow more linear.
- R [38, M, c] A tube shall be used to interconnect the valves and the shaker part of the device.
- R [39, H, c] All the joints shall be leak-proof to avoid unwanted spillage and contamination.
- R [40, H, c] Tubes and pipes shall be cleaned after each drink to avoid contamination of the new drinks.
- R [41, H, c] A microcontroller shall control all the functions of the liquid dispenser.

Shaking Chamber

Requirements for the shaking chamber are defined in terms of the speed that it shakes the mixture, strength to shake the entire container and the required durability of the mechanical parts to operate the device.

- R [42, H, c] Shaking Chamber's inner shell shall be made out of a material that can keep the drink cold and avoid producing toxic contaminants.



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- R [43, L, c] Shaking Chamber outer shell shall be made out of plastic for durability.
- R [44, H, c] Shaking Chamber shall move vertically with a reasonable speed to shake the entire drink efficiently without diluting of the drink.
- R [45, H, c] Shaking Chamber shall be able to pour the mixed drink into the Martini glass placed on the glass holder without spillage.
- R [46, H, c] Shaking Chamber shall be able to detect the presence of the glass to avoid pouring the drink in the drain.
- R [47, H, c] Shaking Container shall be detachable from the Shaking Chamber mechanism to accommodate the cleaning requirements.
- R [48, H, b] Shaker shall be dishwasher safe.
- R [49, H, c] System microcontroller shall control the motor and motor driver system.
- R [50, H, c] A position detection mechanism controlled by the microcontroller shall decide in what position the shaker shall stop in order to avoid spillage.

Power Supply

Power Supply requirements are defined in terms of the voltage, current and power that it can provide to the system. Power Supply must be able to provide variety of different voltages to accommodate the need of each part of the device, each with different voltage and current requirements.

- R [51, H, c] System Power Supply shall be stable, well designed and isolated from the liquids to avoid producing shock to the users.
- R [52, H, c] Power Supply shall be compatible with the North American hydro system.
- R [53, H, c] Power Supply shall be smart enough to deal with sudden variations in the electrical power line.



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Physical Requirements

To be consistent with home appliances standard physical requirements, the following requirements need to be satisfied.

- R [54, L, b]** Dimensions of the device shall be comparable to those of the other kitchen appliances.
- R [55, H, c]** Weight shall be heavy enough to avoid excessive movements during the shaking process, and light enough to be easy to be carried.
- R [56, H, c]** Bottles shall be on the top, shaker in the middle and the glass holder on the bottom so the liquid flows naturally by gravity.
- R [57, H, c]** Power connections shall be made at the rear of the device.
- R [58, H, c]** The enclosure shall be strong enough to withstand the vibrations produced by the shaker as well as the weight of the bottles placed on the top of the device.
- R [59, H, c]** Bottles shall have appropriate capacity in order to provide the ingredients for at least 10 drinks.

User Interface Requirements

General Interface

The only way that user can communicate with the device is through the user interface. Therefore it is required to have a simple, easy to understand and practical user interface.

- R [60, H, a]** Total number of buttons on the device shall be limited.
- R [61, H, c]** The buttons should be water resistant.
- R [62, H, c]** The drink selection shall be confirmed by a special button.
- R [63, H, a]** The user shall be able to cancel the wrong drink selection by pressing a special button.



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- R [64, H, c] The user shall press each button multiple times in order to scan through available drink choices.
- R [65, H, c] System's state at any moment shall be indicated by a certain LED.
- R [66, H, c] Only one button shall operate at a time.

Menu Interface

- R [67, L, b] LCD shall Provide the user with more drink selection choices.
- R [68, L, b] Navigation through the menus on the LCD display shall be done using at least four buttons.
- R [69 L, b] Programmable user interface shall give users freedom to define their favorite drinks.
- R [70, L, b] Programmable UI shall be capable of loading and saving the user defined drink recipes.

Regulatory Requirements

Saaghy™ is mainly intended for home use so it is subject to a set of government regulations for safety:

- R [71, M, c] **Saaghy™**'s structural materials shall be compliant to the following FDA's safety codes: 4-101.11 - 4-101.15, 4-101.19, 4-201.11, 4-202.11
- R [72, H, b] **Saaghy™**'s design and construction shall be compliant to the following FDA's safety code: 4-201.11
- R [73, H, b] **Saaghy™** shall be compliant to the following FDA's "cleanability" codes: 4-202.11, 4-202.16, 4-601.11, 4-602.11
- R [74, H, b] Saaghy™ shall be compliant to the following FDA's functionality codes: 4-204.13, 4-204.15, 4-204.16, 4-204.17, 4-204.123
- R [75, H, b] Saaghy™ shall be compliant to the following parts of the Canada's Energy Efficiency Act: Part I, Part II and Part III



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To avoid serious injuries due to the significant weight, the device should be handled with caution. The user is expected to handle the power cord gently by pulling the plug rather than the power cord to avoid any damage to the power cord.

Although this device is designed for maximum safety and many safety precautions have been taken to avoid shock and serious injuries, the user should never handle the unit with wet hands. Moreover, the device should not be operated in extremely wet environments. Users should never wash any part of the device that is not intended to be washed. Also an unauthorized person should never try to repair the device.

Documentation and User Training Requirements

Saaghy™ can be used by any individual over 19 years old. The assumption is that the user has minimum technical knowledge therefore a manual should be accompanied with each device. The documents should explain the procedures step by step to put the device together and also easy to be referred to once there was a problem during the usage of the device.

- R [76, L, b]** Instruction shall be written in English and French.
- R [77, L, b]** Minimum technical understanding shall be considered while writing the manual.
- R [78, L, b]** Any update in regards to Saaghy™ such as new CDs, FAQ and customer service shall be found on the SST website.
- R [89, L, b]** Complete demo of cleaning procedure shall be available on SST's website.

Device Limitations

Saaghy™ will undergo a series of development phases before it is commercialized. Device prototype will be ready at the beginning of April 2007. This device will not be fully functional as it is intended to serve as a proof-of-concept only. This device will only mix a limited number of liquids. Container holder will not recognize the containers' contents and therefore the device cannot be programmed to produce custom drinks. As a result, UI will be much simpler than the production version.



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Conclusion

The requirements stated in this document clearly specify the functional spectrum of our device, Saaghy™. We have planned to finish the prototype of the device by the beginning of April 2007 and to develop a production version in one year. By mid March 2007, high prioritized requirements are planned to be possessed completely. In the remaining time we will tackle some, if not all, the medium priority specifications and a few low priority specifications. The remaining requirements will be fulfilled for the future production device.



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References

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