VIRTUAL ENRICHMENT CENTRE (VEC)

Design and Prototyping
CSC318S Assignment 4
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TABLE OF CONTENTS

† denotes a section which has been updated since the previous version of the document (Assignment 3).
‡ denotes a new section (Assignment 4).

1. DOCUMENT SCOPE

This document is an evolving, cumulative work-in-progress that documents the current position in the user-centred, iterative design continuum of the Virtual Enrichment Centre (VEC), an interactive virtual community for seniors. In its present form, the document summarizes results obtained from the initial concept design and development phase and, most recently, the prototyping phase. It is the result of a series of "brainstorming" sessions of the design team and the related feedback obtained from the representative target user base.

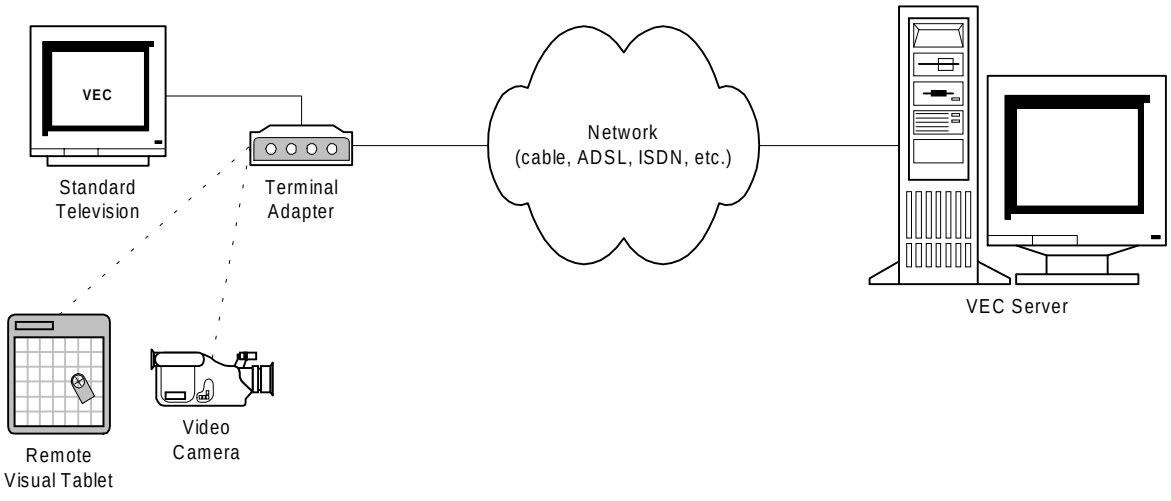
This document serves both as a foundation and a road-map for the next phases of design and development, as well as future instances of the iterative design cycle. Specifically, the aims of this version are to update previous results and conclusions, and to outline the design and development principles of a working prototype of the VEC.

The purpose of the prototype is to vividly and tangibly exhibit the essential features of the user interface or "look and feel" in order to allow a hands-on examination and evaluation of the proposed system by the representative target user base. This previously unavailable method of interaction will increase user involvement (affirming the notion of user-centred design) and, more importantly, yield "richer" feedback data than was previously possible with standard interviews and questionnaires. As such, the prototype will stimulate the next stages of iterative design and development, gradually moulding the prototype into a complete system which fulfils its proposed design goals and objectives.

2. SYSTEM OVERVIEW

The Virtual Enrichment Centre (VEC) is not a novel technology, but rather a novel way of using existing technology. It is a whole that is greater than the sum of its parts. The VEC combines existing technology, such as the television, VCR, camcorder, and remote control, to create an interactive virtual community for seniors.

From the user's perspective, the system is simply an enhanced television with interactive capabilities available through various input devices, most notably a graphical touch tablet. To use the system, the user sets his/her television to a designated channel (channel 3 in most configurations), and turns the VEC unit on. The system displays a splash screen and a main menu of options right out-of-the-box. The user then navigates through the system using the familiar television metaphor. Content is organized into channels and programmes, and can be controlled using a remote control or VCR interface. This proposed use model minimizes the learning curve and because it works through a television, it removes the stigma often associated with computers and other proprietary devices.



3. TARGET USER BASE

An analysis of Canada's population reveals a conclusive trend in aging. Last year, seniors (those aged 65 and over) made up 12.3% of Canada's total population[1], a figure expected to reach 15.9% by the year 2016[2]. One of the factors responsible for this incline is increased life expectancy due to long-term declines in death rates from heart disease and strokes. Life expectancy has increased by nearly ten years between the birth periods of 1920 to 1950 (life expectancy figures: 59.37 years in 1920, 61.00 years in 1930, 64.58 years in 1940, and 68.51 years in 1950)[3]. In 1991, a person aged 65 had an average life expectancy of 18 years, over a year more than in 1981 and almost five years more than in the 1921 to 1941 period[4]. Not only are today's seniors living longer, but the vast majority (approximately 75%)[5] are in good, very good, or excellent health. Consequently, most of today's seniors live at home, as opposed to in an institution such as a nursing home. In 1991, 92% of all people aged 65 and over lived in a private household. More importantly, a substantial proportion of these seniors live alone. In 1991, 28% of seniors lived alone, compared with just 8% of those aged 15-64[6].

An examination of this demographic group's lifestyle patterns reveals that seniors generally have more leisure time than people in younger age groups, with television viewing accounting for a considerable proportion of this free time. Additionally, seniors are travelling for leisure far more than they did in the past[7]. In terms of more passive activities, the *General Social Survey*[8], commissioned by Statistics Canada, concluded that 90.1% of those aged 60 years and over read

[1] Source: Statistics Canada, CANSIM, Matrix 6367 (1997).
[2] Source: Statistics Canada, CANSIM, Matrix 6900 (1996).
[3] Source: Statistics Canada, Catalogue No. 82-221-XDE (1996-1997).
[4] Source: Statistics Canada, Catalogue No. 85-519-XPE (1996-1997).
[5] Source: Statistics Canada, Catalogue No. 85-519-XPE (1996-1997).
[6] *ibid.*
[7] *ibid.*
[8] Source: Statistics Canada, General Social Survey (1992).

newspapers (83.8% on a regular basis), 72.9% read magazines (59.0% on a regular basis), and 60.3% read books (44.2% on a regular basis).

The characteristics of today's retirees make them an ideal target user base for an interactive virtual community like the VEC. The abundance of passive time spent by today's retirees can be turned into a more active, self-improving and rewarding experience. Even though seniors are a vast demographic group, the aim of the VEC is to span the complete spectrum of users and offer an enriching experience for everyone. For example, the active users can take part in cooking and gardening instructional content, health and exercise activities as well as extensive travel information all at their own pace and leisure. The more passive user may be interested in real-time news, religious services, and product showcases when they want and however often they want. Furthermore, those that enjoy participating in social activities can join in a game of bridge or bingo with other users of the VEC, while those wanting to take a participatory role in the workforce can contribute their skills and expertise through the mentorship service. The overall goal of the VEC is to enrich the life experience of its users through four key areas (educational, mentorship, recreational and lifestyle) fostering a sense of purpose, self-improvement, and most of all, self-worth. The VEC is specifically designed to meet these goals with the outlined target user base.

4. CONCEPT DESIGN AND DEVELOPMENT

The inspiration for this concept is quite simple to see after a rudimentary task analysis: currently, a vast majority of retirees are, in the words of one interviewee, "sitting around doing nothing". It is the VEC's aim to enrich that often mundane and unrewarding life experience. The plan is to develop a product that could provide substantial activities in which the user could participate at his or her own leisure. What is a substantial activity? Suffice it to say, that many retired seniors would rather be doing more than coupon clipping or playing solitaire. There are two types of activities that we believe are the kinds of things that users would find enjoyable and rewarding: self-improving activities, and socially engaging activities. Self-improving activities that we have proposed to include are educational services and health and lifestyle services. Socially engaging activities that we have proposed are mentorship services that would put their life experience to use and recreational services which they can use to keep connected to society. So how do we go about developing this concept?

At this stage, our contact with potential users has been limited to feedback on the concept's specifications. We interviewed a small sample of individuals from age 65 to age 80 about what benefits they would look for in a technology designed for them. Our five subjects are all retired, still relatively active, and possess full cognitive faculties. However, after retirement, all of our subjects complained that they have been largely unproductive. Most of their daily functions are now undirected and lack purpose. In the words of one subject, they are "doing a lot of time-killing". Consequently, our subjects all agreed that they would like to return to productive activity without compromising their retirement lifestyles. This feedback complements the initial parameters established in the VEC proposal. In fact, two of our subjects expressed immediate interest in the technology when we explained

what the VEC would have to offer. Once we have a prototype to bring to the subjects, we will conduct a more in-depth interview with them concerning the features and shortcomings of the initial product.

As stated earlier, the subjects currently spend most of their time at home sitting around watching television. Thus, their environment can be reduced to a chair or bed, and a TV. Despite their dissatisfaction with the status quo, this environment is still comfortable for these subjects. By introducing the VEC via the television, it requires only small changes in how the subjects would normally interact with their environment, namely that they would have an active relation (interaction) with the TV as opposed to a passive one (viewing). This should make the addition of VEC as unintrusive as possible.

As well, the majority of our subjects recommended that the final product should be very easy to learn how to use. They stated that it would be unlikely that they would use such a technology if it required more than a negligible amount of effort to learn. Only one of our five subjects has experience with computers, so it is clear that the features of the VEC must be tractable for those who are not computer literate. This will be one of the primary concerns for the design of this project, as it means we will not be able to employ the typical interface metaphors used in the personal computer industry. Given that the service is being provided through the subject's television, we believe a good candidate for an interface metaphor would involve the domain of the television. For example, we could offer options in terms of channels and programmes, something with which anyone who has used a TV guide should be familiar. Another possible metaphor would be to use a community centre approach, with option offered in terms of centre facilities (eg. Library, Auditorium, Rec. Room, etc.). Again, this format would be more intuitive than an existing PC metaphor for an individual who is not computer literate. Furthermore, either of

these metaphors would provide a much simpler learning curve, ensuring that the subjects will not be discouraged from using the product from the outset.

5. PROPOSED FUNCTIONALITY (BRAINSTORMING)

The brainstorming sessions were focused on three key areas: VEC content inclusion, software interface issues, and hardware interface issues. They are outlined as such below.

5.1 - VEC CONTENT INCLUSION

The content of the VEC falls into four distinct categories organized into "channels" (each of which consist of "programs"): educational, mentorship, recreational and lifestyle. These four categories represent the goal of the VEC to enrich the experience of seniors through self-improvement, participation and social engagement, ultimately improving the level of self-worth and productivity, which is all too often lost after leaving the workplace. All content is presented as a combination of audio, video and text elements, as traditional television programs are, except that the programs are not presented in a linear fashion. In other words, the user can choose what to watch, when, and at what pace. In this regard, the VEC takes the television concept further by melding it with VCR concept, inheriting functions such as pause, rewind, and forward (which the vast majority of seniors is already familiar with). For example, when watching a cooking program, the user can pause at any time to follow along, or jot the recipe down.

The educational channel includes programs focusing on intellectual self-improvement, providing an opportunity to develop new skills or brush up on old ones. These include lessons on a wide range of topics ranging from history to creative writing courses (see Section 6 for a proposed use model). This channel also includes the option of completing a college or university degree through distance learning. This is made possible through unique partnerships with accredited distance learning institutions such as The California Virtual University (URL:

http://www.california.edu), which ties together the online and distance education offerings of every accredited college and university in California. For the active user, this channels boasts many programs requiring participation, such as cooking and gardening lessons. This channel also includes up-to-date news and the latest scam alerts to protect the users from fraudulent activities often targeted specifically at seniors. Additionally, another major component of this channel is an extensive travel information base, which consists of travel destination profiles, places of interest, interactive maps, flight and accommodation information.

The mentorship services offer the opportunity to be a virtual volunteer and maintain a high level of productivity and self-worth. This is organized on a user-by-user basis and can be carried out in a personal (ie. adopt-a-grandparent) or professional capacity (see Section 6 for a proposed use model).

The recreational channel is the social component of the VEC. This vital component includes virtual gatherings with other members of the community who are online. The choices here range from one-on-one A/V full-duplex chats, to bridge and bingo games (see Section 6 for a proposed use model), to religious services.

The final component is of vital importance to the user's physical well-being, namely, the lifestyle channel. The content included here consists of numerous health resources (diet and medical information) as well as exercises geared specifically to the user's age and condition (see Section 6 for a proposed use model). Additionally, the user can get one-on-one medical assistance in emergency situations.

5.2 - SOFTWARE (ON-SCREEN) INTERFACE

The functionality of the on-screen interface is very simple. Options will be presented on large button-like icons. Depending on the hardware input device the user employs, they can "press" the button in order to make their selection. The screen will then change and present subsequent options or will provide the

corresponding content. The on-screen buttons will be made large and obvious so that the seniors, who may not be used to a point-and-click interface, do not have to hunt around the screen for "hot links" or "clickable areas". The amount of information and options presented at one time will be kept to a minimum so as not overwhelm any potentially computer illiterate users. The software side of the interface required a small amount of brainstorming.

Clearly, the most important features of the on-screen interface are going to be intuitive operation and simplicity of appearance. The most important part of the brainstorming was to come up with issues that address the special needs of seniors. Unlike a new media project for the general public, a product for a largely elderly demographic group has certain constraints. For example, seniors may have limited eyesight, limited hearing, and shorter attention spans when it comes to computational media. We look for possible solutions to these issues when we were brainstorming ideas.

One potential problem is the tricky balance between making a stylistically aesthetic interface and making an easily legible interface. Lately, the graphic arts have been quick to use fancy drop shadows on text, and contrasting fonts for effect. Such attributes seriously compromise the legibility of menu items particularly for seniors whose visual acuity is not what it used to be. Our idea to avoid this is to keep text on a plain background so that if we do choose to add style, we can do so without interfering with what needs to be read. Thus, we should be able to make a visually pleasing screen with keeping it easy to read for seniors.

Another issue we thought of was that of print size. This is a twofold problem, in that the print on the screen could be too small, and the screen itself maybe small making everything that appears on it difficult to read. Our initial plan to correct this problem was to devise a method to adjust print size depending on the screen size. However, this adds further complications because under certain circumstances, it

may be impossible to fit all of the menu items on the screen at the same time. We later came to the realization, though, that screen size probably will not be a serious concern. If the screen is somewhat small, then the senior watching it will have situated himself close enough to see it clearly when watching it normally, so in these cases they should be close enough to read text regardless of the screen size. All that needs to been done is to ensure that the text size used is big enough in relation to the proportions of a television viewing area. That way, if the senior is close enough to see the screen on a smaller TV, they will also be close enough to read the text. Thus, this should not affect the proposed functionality of the on-screen interface.

One idea that we have come up with is still under consideration. We thought of the possibility of designing different shaped on-screen buttons so that they will be easier to recognize than a text label. The potential advantages of this would be increased ease of use and recognition of operations. As well, it would eliminate the need for small text on the button that may otherwise be too small to read. The potential disadvantages are that it may inadvertently confuse the operation of the VEC if the shapes we choose are too ambiguous or obscure. This is something we will need to investigate when we begin the prototyping phase.

5.3 - HARDWARE INTERFACES

This brainstorming session concentrated on a touch-screen tablet, a glove, and other input methods.

The basic idea of the touch-screen tablet is to provide a simpler interface than the traditional mouse, which requires good control of hand movement. The touch-screen tablet will display the available options that the user can choose from based on the content displayed on the main screen (WYSIWYG: What You See Is What You Get). There is a wide spectrum of users that can benefit from this interface. For senior users, low demand on agility and strength and an interface closely coupled to

other long existing products makes the touch-screen table intuitive and very easy to use.

The touch-screen tablet is designed for in-door usage. The wide screen and touch-sensitive area allows a large margin of error as there is no need for the user to push the exact center of a button (the buttons can be large and adequate space can be left between them to minimize the probability of a wrong input due to a hand tremor or other condition). The table itself can be secured on the arms of a chair or put on a table. Also, it is designed to be a cordless device. The user will have the comfort to input the commands from a distant sofa or chair. Also the cordless design will prevent accidental tripping over the cord connecting the panel and the main system which can result in serious injury.

Different detail levels can be chosen in order to fit the preference of different users depending on their eyesight and familiarity with computers. Also, the font size of the display can be adjusted to display more or less. The response time of each input and changing of options can also be adjusted for people with a low reflection response.

The selectable options displayed on the touch-screen panel will change with the content on the main screen, so these buttons are not fixed. Also, there will be space between each selectable area to prevent the accidental or wrong selection. Further, the selectable buttons will not be just squares with text inside them, they will include graphics, little or large pictures, different colors to simplify usage and pattern or color matching to the current content of main display screen.

The force required to push the button so that the panel recognizes it is a legitimate input from the user (and not an accidental push) can be adjusted to fit different users with the particular strength they are comfortable with.

There will be a help button on every menu page, and the help information will be displayed on the main screen if the user has questions about what the choices are

and what the functions of the buttons are. The tablet itself has a fixed, physical button which, upon pressing, will always take the user back to the main menu to start over.

The glove is an input device that is currently around but not yet in general use. This device can be use by the elderly with ailments such as tremors who cannot control their hand movement to point at a specific area (which makes a device like the mouse impossible for them to use). The user wears the glove like an ordinary glove, and they input the commands by bending one or a combination of their fingers, like the gloves for 3-D environment on the market. This way, the commands can be input without being affected by the shaking of arms and/or hands. The movement of the user's hand will be "traced" on the screen making it a highly intuitive and easy to use input device. The main drawbacks of this include the user's hand fatigue, and having to take the glove off to stop input when carrying on another activity.

The two ideas mentioned above, the touch tablet and the glove, can be combined into one interface. Sensor chips, which sense the pressure or electronic signal, can be placed on the tip of each finger of the glove. By pressing the finger against the tablet, commands can be issued depending on the digit which made contact with the tablet. This way, different fingers can be assigned different functions and this assignment can be expressed on the screen.

Other input methods that will seamlessly integrate with the system include a tablet with a fixed number of coloured buttons, which are represented by corresponding functions of the screen, and speech recognition. This allowance of a multitude of input devices affords flexibility and a wide user base (including those with acute ailments).

6. PROPOSED USE MODEL ("A DAY-IN-THE-LIFE" SCENARIO)

As mentioned previously, a day in the life of a potential user is currently innocuous in many cases. Essentially, the individual gets up in the morning, does any of the daily chores if necessary, watches television when not doing anything (which is the case more often than not), and then goes back to bed. It is this inactivity that we wish to address. This is how we envision that we can put our users' free time to better use.

Consider a hypothetical subject, "Chuck", who is 67 years old and is a retired board member of a prestigious manufacturing corporation. He is still healthy and could easily be active, however, before finding the VEC he just sat around without anything to do. Now that he is a VEC user, his daily regiment is more productive. He gets up, turns on the TV, and flips the switch on the VEC terminal adapter and he is presented with the main menu. Using the touch tablet, he selects LifeStyle services. At this menu, he selects dietary recommendations to determine what he should have for breakfast. Based on the information he submitted when he subscribed to the service, the VEC suggests that he should have a bowl of bran flakes, a glass of orange juice and some toast with peanut butter. After finishing breakfast, he returns to the LifeStyle service and selects the exercise option. He chooses a morning workout presentation that has been provided by a registered physiotherapist. A digital video presentation appears on the TV that he can follow. The benefit of these functions is to provide Chuck with the tools necessary to maintain his good health. Without this service, he would likely just sit in his chair and watch television, which clearly is not a healthy lifestyle for someone his age.

Next, he selects the Educational service and calls up the next lesson in his creative writing workshop. One of the things that Chuck has always wanted to do is write a book, but before his retirement he never had the time to develop his writing

skills, let alone find the time to write. Now that he has more leisure time, he has been able to develop these skills. Today, there is a live presentation with Professor Ludovico from the University of Somewhere who will provide some lessons on developing an idea into an overall story line. The benefit of this service is to ensure that Chuck does not let his mental faculties deteriorate just because he has retired from the active work force. Furthermore, he can develop new skills and still be proud of his accomplishments which gets back to our philosophy of self-improvement. Again, without the VEC, Chuck would be unproductive and would not have any projects to keep him active. Furthermore, with the VEC, he can study any of this material at his own pace and at any time of his choosing.

Later in the day, Chuck prepares for his seminar with the board of directors at a company similar to the one he worked for. He selects the Mentorship service, and chooses the connection to the remote board room. Chuck can now be seen and heard by the members in the board room via the camera and microphone connected to Chuck's terminal adapter. The members in the board room can be seen by Chuck with a similar setup that the company borrowed from the VEC service provider for the occasion. Now that Chuck has a two-way audio-video connection, he is able to field questions from the board and makes suggestions based on his life experience. Again, all of this can be done from the comfort of his living room. The benefit of this service is that Chuck remains in touch with the working society, and is able to stay abreast of social developments. As well, he gets a sense of purpose by applying his life experience to a worthwhile cause. Without the VEC, Chuck would feel that all the work he has done in the past was all for nothing since otherwise he would just sit at home alone.

After a full day, Chuck has some dinner and decides he would like to have a little fun. He returns to the VEC and selects the Recreational service. Chuck then chooses the on-line poker option and sees that there are already several groups

gathered. He joins one of the games and up come the other player's pictures across the top of the screen. Across the bottom of the screen is his hand and the betting information. Using the touch tablet, he can select his bet, pick which cards to discard, etc. Throughout the game, he has a full duplex audio connection with the other players (via the microphone) so they can chat while they play, just like a real poker game. After cleaning out his friends, Chuck leaves the game and checks out the chat room option. He spots the name of a woman he spoke to last night in one room so he joins her in a private chat. Similar to the connection used in the board room connection, Chuck can now conduct a two-way audio-video connection. The benefits of the seservices are a bit more obvious. Without some sort of social stimulus, seniors tend to become reclusive, disconnected from society. This lifestyle is unhealthy and potentially dangerous if no one knows of their condition. The VEC attempts to address this issue by offering a service that will allow users to socialize from the comfort of their own.

In general, the main benefit of the VEC is that it offers users the opportunities of self-improvement and social engagement without having to leave their home. This is what makes the project unique in that although similar services are available in real life (from community centres or seniors clubs), many seniors do not take advantage of them. This is due either to infirmities, a lack of a mean for travel, or simply because they have gotten lazy. Instead, the VEC brings these services to them, making it much easier to take advantage of them.

7. USER CONTACT AND FEEDBACK

The informal survey carried out in the previous stage, concept development, confirmed the feasibility of the development of an interactive virtual community. During the current prototyping stage of the VEC, a more formal and rigorous survey (see Appendix) was completed to serve as a motivating factor in the design of the prototype. Questions were formulated in such a way as to provide quantitative and qualitative feedback on issues of design and content. The questionnaire, consisting of 15 multiple choice questions, was given to the same representative sample used in the previous stage of the iterative design process.

7.1 - SURVEY RESULTS

The results of the survey are summarized below:

Subject	Sex	Q1[a]	Q2[b]	Q3[c]	Q4[c]	Q5[b]	Q6[b]	Q7[b]	Q8[b]	Q9[c]	Q10[c]	Q11[c]	Q12[c]	Q13[c]	Q14[c]	Q15[c]
1	M	1,2,5,7,8	1	1	0	2	3	3	1	0	1	1	1	0	1	0
2	F	1,2,3,5,6,7	1	1	0	1	1	1	1	0	0	0	0	0	0	1
3	F	1,4,7	2	0	1	2	3	2	1	1	1	1	1	1	0	0
4	M	1,2,3,4	3	0	0	2	4	3	2	0	0	0	0	1	0	1
5	M	1,2,3,4,6,8	1	0	0	4	3	2	1	0	0	0	0	0	0	0
Avg.			1.6	0.4	0.2	2.2	2.8	2.2	1.2	0.2	0.4	0.4	0.4	0.4	0.2	0.4

[a] 1=television, 2=newspaper, 3=periodicals, 4=books, 5=travel, 6=exercise, 7=cook, 8=work/volunteer
[b] 0=a, 1=b, 2=c, 3=d, 4=e
[c] 0=yes, 1=no

- all subjects watch television on a regular basis for an average of 1-2 hours per day;
- most subjects keep up to date with current events by reading the newspaper on a regular basis;
- although there was no dominant "active" activity (see 5-8 above), most subjects had at least one active component in their list of activities;
- the majority of subjects know how to use a VCR and remote control;
- the majority of subjects was curious about computers, with none having a negative reaction towards them;
- there exists a positive correlation between responses to questions 6 and 7 (correlation coefficient = 0.8729) implying that increased control over programming, and interaction/responsiveness of television would have a positive impact on viewing habits;

- controlling the "pace" of programmes has no significant impact on viewing habits (this question may have been improperly worded, thereby not soliciting the desired responses);
- the vast majority of subjects is on a diet and would take advantage of dietary advice;
- the majority of subjects takes prescribed medication and would take advantage of medical advice;
- there is a strong positive correlation between taking advice on dietary and medical issues (coefficient = 1) implying that those users that agreed to one, also agreed to the other (and vice versa);
- most respondents currently do not have an exercise routine but would take advantage of one if it was available;
- the majority of subjects would participate in interactive social activities.

7.2 - SURVEY CONCLUSIONS

The results reaffirm the feasibility of the development of an interactive community for seniors. Moreover, they shed light on certain design and content issues. Since it is apparent that most potential users are familiar with the television interface and use it on a regular basis, it is the focal metaphor in the prototype's design.

Reflecting the results of the survey, the content of the VEC is organized into channels and programmes which can be viewed using a television guide motif and selected using a remote control interface. Furthermore, the actual content is interactive and can be controlled using a VCR interface (where applicable), which the majority of subjects is already familiar with.

The survey also reaffirmed the inclusion of the proposed content as outlined previously. However, a question regarding mentorship services was inadvertently left out of the questionnaire, but will be included in a future survey. Preparations are already underway to formulate the next survey to gauge the usability of the prototype. Additionally, this next survey will be conducted on a broader representative target user base increasing the level of confidence of the conclusions.

To summarize, although the survey results are based on a small representative sample of the target user base (which may potentially weaken the

strength of the conclusions drawn), the results imply that the VEC can be a meaningful and beneficial addition to a senior's environment. From the design and development standpoint, the key is a focus on the familiar.

8. PROTOTYPE DESCRIPTION

The prototype of the VEC was created using an industry standard tool, Macromedia Director. It is essentially a simulation, in form and function, of the exact user environment, at various stages of development. The objective of the prototype then is to mimic as closely as possible the envisioned environment of the VEC, with each iteration nearing that vision. It is highly plausible that the development of the final, "live" version of the VEC will be carried out using Director.

In its present form, the prototype is a multimedia Director sequence implementing the core, or "critical mass" of the look and feel, or user interface. It shows what the application looks like, what its essential characteristics are, and how it can be used. The model also includes the first "virtual" prototype of the graphical input tablet (a physical prototype of this device will be created at a later stage). The tablet display contents are simulated on the screen and can be accessed by a gray arrow at the bottom of the screen. Rolling the cursor over the arrow, switches the simulation from screen view to tablet view (or vice versa). Note that the arrow is at the top in the tablet view.

The aspects of the VEC that bring out its inherent novelty and uniqueness are the Educational and Mentorship channels. With this premise, the prototype simulates these two features at this early prototyping stage. Since not all of the functions work, please read the synopses to see which options are currently not implemented.

On startup, the user is greeted with a simple splash screen and some music as the time required to connect is simulated by a brief pause. The splash screen clears and four TV screen-shaped buttons appear. Each screen contains the first letter of each of the four VEC services, and is labeled in full below each button. Each service button has a unique colour to increase familiar recognition of the controls. On the tablet, four touch areas are simulated, each bearing the colour and letter of

the corresponding option on the TV. The tablet buttons are mapped to the same relative positions as the appear on the TV, making the use more intuitive. Whenever a touch area is pressed (or clicked on in the scope of the prototype), there is a beep to let the user know that the command is acknowledged. For this alpha version, though all buttons will work, only Education and Mentorship contain any content.

If the user selects Education or Mentorship, the buttons will disappear from the TV and a small banner indicating the respective service pops up in the lower right hand side of the screen. This allows the user to always have clear knowledge of what part of the system they are in currently. At this point, a selection menu will appear that has been designed to resemble a TV guide. Presently, only six selection items, at most, appear at the same time. If more items are available, a simple next page/previous page function can be set up. However, it is not implemented in this prototype version. On the tablet, the channel numbers appear in the same order that they appear on the TV. Also on the tablet is a 'Return to main' button which can be used at any point to go back to the main menu.

After making various selections, some of which have been omitted for the sake of brevity, the user gets to the content portion of the service. The examples for both Education and Mentorship are simulated with sound and text, as well as place holders for the digital video that will be added to the more advanced prototype. For this simple prototype, the content is cut short and the user is then returned to the selection menu. However, sufficient content is provided to give the user an adequate understanding of how the final candidate will function.

9. PROTOTYPE DESIGN PRINCIPLES

9.1 - KEY DESIGN PRINCIPLES

There are essentially six key design principles that were identified during the prototyping stage and most have been incorporated into the current prototype:

1. simplicity (or the KISS principle):
    - designing a simple (yet elegant), straight-forward and, most of all, intuitive "look and feel" rather than a graphics-intensive and flashy one;
    - a focus on clarity - keeping the design of screens uncluttered (well-spaced) with large, clear text;
2. consistency:
    - maintaining consistency across all aspects of the user interface - colour schemes, affordances, expected behaviours and responses;
    - maintaining consistency across the on-screen and tablet interface - physical buttons on the tablet mimic the design of the on-screen interface and the 4 main navigation buttons have a unique-coloured letter in them and are also labelled below (in the same colour) so that the user can use textual, spatial, and/or colour relations to match the tablet controls to the on-screen menu;
    - header (bar at top of every screen) distinguishes the VEC from other television uses.
3. ease of navigation:
    - achieving ease of navigation through the WYSIWYG (What You See Is What You Get) principle - all options are displayed on the screen and all behaviours are predictable;
    - see below for discussion of display/selection alternatives.
4. use of familiar mental models and metaphors, and feedback:
    - use of television metaphor (channels, programmes, viewing guide);
    - use of remote control and VCR metaphor (controlling content);
    - use of audio feedback to confirm actions (simulate a button "click");
    - primarily driven by results obtained from user feedback.
5. "escape route":
    - providing a means of "escaping" through a button in the header at the top of every page (returning the user to the VEC main menu).
6. instant support:
    - providing an audio/visual help facility for every screen/option.

It should be mentioned that there are also inherent disadvantages to such a simple design. Although it is ideal for neophytes, the design could prove cumbersome for experienced users, especially in the aspect of navigation. This possibility will be explored in future user testing and gauged by future user surveys. The results will be integrated into the next prototype iteration.

9.2 - EVALUATION OF ALTERNATIVES: SELECTION PARADIGMS

Several different selection paradigms were considered and the choices were narrowed to three main options (see sketches in the Appendix):

- Horizontal bars/arrows style:
  - the user selects the desired option on the tablet or scrolls up/down to see more choices;
  - the main advantage of this style is that the options are very clearly displayed;
  - the main disadvantages of this style are that a large proportion of the screen space is wasted on the scrolling mechanism (bars/arrows) and that only linear navigation is possible.
- Multiple box style:
  - the user selects the desired option from one of four choices or navigates back and forth between screens using the NEXT and PREVIOUS buttons;
  - the main advantage of this style is that more options can be displayed on one screen;
  - the main disadvantages are that the screen may become cluttered and the navigation buttons take up valuable screen space;
- TV Guide style:
  - the user selects the desired option (by punching in the corresponding channel number on the tablet resembling a remote control) from a TV Guide style listing and navigates by means of a "page-flip tab" on the bottom right hand corner of the screen;
  - the main advantage is that the navigation and selection mechanism has been moved off the main on-screen interface and onto the tablet considerably freeing up the display area;
  - the main disadvantage is that if too much information is displayed in each listing, the display will be cluttered (in this case, just the programme name can be displayed and the user can get the complete listing for the programme by selecting it[†]);

[†] The current prototype does not implement this feature.

- this selection style closely mimics a mental model familiar to the vast majority of the target users, so it has been selected as the candidate for the current prototype.

At the heart of the above-mentioned design principles is the somewhat implicit notion of user-centred iterative design. The outlined principles and decisions made by the designers at this stage are only as good as the feedback they receive from the users. As such, this section of the document is a continuing work-in-progress as feedback is received from the users, and then is evaluated and incorporated into the next prototype by the designers.

10. THE DESIGN TEAM

The VEC development project is currently being undertaken by three members of CSC318S, an undergraduate course at the University of Toronto, in the Design of Interactive Computational Media.

- **Bill Matthews (g6bill@cdf.utoronto.ca)**

  Bill brings to the project extensive programming skills (C, C++, Java, Javascript, Lingo), 4 years experience with Director/Lingo, design/layout, and writing. He is trained in psychology, sociology, cognitive science, and organized behaviour. He is responsible for on-screen interface design and development, Director authoring, design, and digital audio/video post-production.

- **Chanshin Chang (chanshin.chang@utoronto.ca)**

  With previous experience working in a group, Chanshin will guide the group in achieving effective management and scheduling of the project. His skills include programming in Turing, C, and HTML. He is responsible for designing and development of input devices that interface with the system.

- **Michael Zielenski (g5bios@cdf.utoronto.ca)**

  Michael brings to the project extensive experience in software design and development, with a minor background in sociology and business management. He is responsible for research, analysis and report writing aspects of the project.

A. APPENDIX

The appendix contains a sample user questionnaire which was used to gather the information for the survey cited in the document, and some preliminary hand drawings illustrating the alternative selection styles.

VIRTUAL ENRICHMENT CENTRE (VEC)
PRELIMINARY USER QUESTIONNAIRE

Please answer all questions truthfully by circling the most appropriate responses to the questions below.

1. Place a checkmark in the box (☑) next to the activities you take part in on a regular basis (at least once per month):

☐ watch television
☐ read newspaper
☐ read periodicals
☐ read books
☐ travel (at least once per year)
☐ exercise (including walks)
☐ cook
☐ work/volunteer

2. On average, how many hours per week do you spend watching television (circle one)?

a) 0 (never)
b) 1-7 (up to 1 hour per day)
c) 8-14 (between 1 and 2 hours per day)
d) 15-21 (between 2 and 3 hours per day)
e) over 21 (more than 3 hours per day)

3. Do you know how to basically operate a VCR?

a) Yes
b) No

4. Do you know how to operate a remote control?

a) Yes
b) No

5. What is your perception of computers?

a) I hate them and will never use one.
b) I don't think computers are for me.
c) I don't know much about computers but am curious.
d) I've used them or seen them used and want to learn more.
e) I don't know how I ever got along without one!

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VIRTUAL ENRICHMENT CENTRE (VEC)
PRELIMINARY USER QUESTIONNAIRE

6. If you could dictate what programmes were on television (as well as their air times), what effect would that have on your television viewing?

a) I would watch less television.
b) It would have no effect on my television viewing.
c) I would be more selective (active not passive), but my viewing time would not change.
d) My viewing time would increase somewhat.
e) My viewing time would increase considerably.

7. If television was interactive or responsive (in other words, if you could actively participate in what was going on), what effect would that have on your television viewing?

a) I would watch less television.
b) It would have no effect on my television viewing.
c) I would be more selective (active not passive), but my viewing time would not change.
d) My viewing time would increase somewhat.
e) My viewing time would increase considerably.

8. If you could control the "pace" of programmes on television (for example, if you could pause, rewind, fast forward, and stop, much like using a VCR), what effect would that have on your television viewing?

a) I would watch less television.
b) It would have no effect on my television viewing.
c) I would be more selective (active not passive), but my viewing time would not change.
d) My viewing time would increase somewhat.
e) My viewing time would increase considerably.

9. Are you on a prescribed diet (for example, has your physician instructed you to reduce the intake of certain foods)?

a) Yes
b) No

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VIRTUAL ENRICHMENT CENTRE (VEC)
PRELIMINARY USER QUESTIONNAIRE

10. If your television provided dietary advice specific to your needs, would you take advantage of it?

a) Yes
b) No

11. Do you take any prescribed medication?

a) Yes
b) No

12. If your television provided medical information and advice specific to your needs, would you take advantage of it?

a) Yes
b) No

13. Do you have a regular exercise routine?

a) Yes
b) No

14. If your television had an instructor-led exercise programme tailored to your fitness level, would you take advantage of it?

a) Yes
b) No

15. If your television allowed you to take part in social activities such as seeing and talking to other people and playing games such as bridge or bingo, would you take advantage of it?

a) Yes
b) No

Internal use only *Do not write in this space*
