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VETUSNET: A SOCIAL NETWORK FOR THE THIRD AGE

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1. Introduction

Population ageing has become a major world concern. This can be seen either as individual ageing, growth of average life expectancy, or demographic ageing, defined as the proportional increase of old people compared to younger strata. The World Health Organization forecasts 1.2 billion people above 60 years old in 2025 and those with 80 and more will be the fastest growing groups [Sousa et al. 2003]. A study from the Portuguese statistics authority (INE) shows that youngsters' share will decrease; by 2050 they could represent only 21% of the total population. Contrarily the share with more than 65 years old will be 15.6% in 2050. The growth rate of the older population is now four times bigger than the younger.

These facts have led some countries to rethink the aged people support policies and develop initiatives to improve their quality of life. The university should be aware of this reality. Thus within the course on Product Development Methodology, included in the syllabus of the MSc course on Industrial Design, taught at the Faculty of Engineering, a project to address the needs of elderly people was proposed to the students. Each team was free to identify a real or latent need and develop a product that satisfies this need. Although we meet daily elderly people or even share lives together, we were far from imagining the fears, deprivations and difficulties that afflict the daily life of aged people.

This paper reports the work carried out by a three student team to develop an innovative product that addresses the needs of aged people, using systematic methodologies of product design and development [Ulrich & Eppinger 2004], that may improve the efficiency and effectiveness of the NPD process.

It is widely known that in modern societies, new hardware technologies, besides voice transmission is being used to improve human social networks. This concept was advanced by [Eagle 2004] and developed into hardware by the Responsive Environments Group's "UBeR-Badge" [Laibowitz & Paradiso 2004] and MIT Media Laboratory's "Sparks" [Chew et al. 2005]. "Sparks" is an ambient social networking and communication facilitation interface, implemented with a tracking camera and an aura interaction producing a GUI response on a specially designed floor. The UBeR-Badge uses a portable electronic badge platform for facilitating interaction in large groups of people, having RF and IR communication capabilities. Virtual networks, on the other hand, have been formed through the Internet.

The importance of networking in different contexts led the team to think of a product that could act as a vehicle of communication among elderly people, thus increasing their social networks.

The teams were required to work in a systematic way not only to provide structure to the design process, but also to test if it was possible to be creative at the same time. Thus the present work follows a methodology proposed by [Ulrich & Eppinger 2004].

2. Methodology

The first stage of a NPD process is the identification of the customer needs (elderly people). For this purpose a survey was then carried out. The data collection technique needed to be well planned, especially for the development of an entirely new product. In order to create a high-quality information channel, the contact with the present users or target population is required. There are several methods of data gathering, the most commons being: interviews, focus groups and observation of users. In the context of this work, limited by an academic schedule, we have chosen the interview method, based on a questionnaire, since it was easier to apply and more adapted to deal with old people.

The questionnaire had 23 questions, most of them of multiple-choice. Open questions were included in order to give respondents the freedom to refer other aspects considered relevant. The topics covered were behavior, family and community life, health, leisure activities, discomfort, annoyances, use of common products, etc.

A total of 55 interviews were carried out: 8 were done in the street and 47 at elderly institutions. The sample comprised 69% females and 31% males. Considering the age groups, 12.7% were below 65 years (therefore excluded from our formal study, but with some interesting contributions), 23.6% were between 65 and 75, 49.1% between 75 and 85 and 14.5% above 85 years old. It was also known that 51% were institutionalized, 28% lived with the family, 13% lived alone and 8% with company other than family.

During the interviews the reaction and behavior of the respondents was carefully observed in order to detect gestures and attitudes that might reveal feelings such as sadness, joy, etc. The way old people used objects such as glasses and cutlery was also carefully observed in order to get some hindsight that might lead to the identification of latent needs.

3. Results and discussion

The analysis of the answers to the questionnaires revealed that main needs were not only a lack of material goods but specially loneliness, with a clear need for communication. Within questions of the type “What bothers you most?”, regarding health afflictions, 69% complained about pain, of which 33% referred headaches. The behavioral answers stressed two negative interrelated aspects: disrespect (39%) and aggressiveness (27%). Sadness was one of the main complaints. Routine events and random activities included walking, conversation and desire for socialization (in 74% of the cases).

Referring to the use of health objects, prescription glasses were used by 38% of the sample (reading glasses excluded); 32% used dentures, 21% walking sticks, 5% crutches, 3% wheelchairs and 1% hearing aids. Shoes were frequently pointed as the worse: unsuitability to swollen feet, rigidity, wrong shaped, and specially the difficulty to put on the shoes in a bended position.

The analysis of the information derived from the questionnaires identified several ideas with potential for further development. The team selected the need for communication as the most promising opportunity, even though many others could have been chosen. Thus, the team decided to develop a product that facilitates networking among aged people. The product mission statement was defined as:

Product description: VetusNet is a portable electronic device for personal and communitarian use, intended to promote special networking among elderly people, public information and emergency.

Strategic goals: development of a simple purpose network (VetusNet), cost around 100 Euro, possibility to be rent by individuals or institutions, introduction by 2010.

Primary market: individuals above 65 years old (84 million in the EU).

Secondary markets: public and private service providers, counties, municipalities, hospitals, social care centers, religious institutions, public transportation, associations, and relatives.

Assumptions and constraints: privacy secured, 10 m range, robust, light and 48 h autonomy. The product should have a simple interface, allowing its use by people with some degree of illiteracy.

Stakeholders: individual users, social security, municipalities, counties, day care centers, elderly institutions, manufacturers and commercial users.

The market was defined initially as consumers with more than 65 years old: approximately 1.700.000 Portuguese; [INE 2005] in EU-25 they are 17% of the population (84.000.000 Europeans). Females

are slightly predominant in the population; this unbalance increases in the third age group, as life expectancy is higher for women. If the 1990's trend is maintained this difference will increase further. A significant number of the interviewees have shown some degree of illiteracy, even above the expected statistical data, according to INE (although the question was not formally included). This would prevent them to use more elaborated interface systems. Illiterate women in Portugal were twice the men's number in the 1990's.
Differences in purchasing power, as in the sampled group are a constraint that should be taken into account. The product to be developed could be paid by social security, others used in elderly institutions and a smaller number could be acquired or rent by the user, all these options depending on the price. In Portugal and some of the EU countries the 65 years old income is not much different from the active age earnings, but it doesn't guarantee by itself a minimum of consumption availability. [Zaidi 2006 and Rodrigues 2003]. The demographic trends in developed countries show that new products for the elderly will represent new business opportunities in the future. The product selected for development was an electronic device to support a communication network aimed at aged people, the VetusNet.
By limiting the network reach to the immediate vicinity of the body the huge offer and variety is lost. Nevertheless data neatness, speed and opportunity will increase. The mechanisms of human memory are limited and as a result a disproportionate exposure to information will inevitably generate confusion. Conversely, other terminal resident services, with specific and limited purposes, would increase their use value by means of the Internet. "The Invisible Computer of the Future" [Norman 2001] envisages an inconspicuous integration of processing power into upcoming products, as a motor inside an appliance. Placing its capabilities in the appropriate use environment released from the PC desk. Table 1 shows the main needs we could identify based on the statistical analysis of the questionnaires and an appraisal of similar technical solutions found in the market.
In order to develop the concept of the product it is necessary to identify the most important attributes of the product, that satisfy the needs of the target population. Table 1 illustrates the main requirements / attributes derived from the analysis of the questionnaires and also from benchmarking of other electronic products available in the market. The hierarchy of the requirements was the results of critical judgment of team members. The next phase was the translation of requirements into product specifications, which will serve as the basis for the concept generation phase.

Table 1. Identification of product attributes

Nº	Need	Imp	Nº	Need	Imp
1	Adaptable to users	5	10	Easy maintenance	4
2	Compatible PC (USB)	5	11	Programmable	4
3	Memory	5	12	Ambient resistance	4
4	Portability	5	13	Mechanical strength	4
5	Privacy guarantee	5	14	Emergency help signal	4
6	Reciprocal communication	5	15	Energy sparing	3
7	Easy of use	5	16	Reliability	3
8	Event alarm	4	17	Unlosable	2
9	Manipulation	4	18	Time information	2

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Table 2. Product specifications

Needs	Metrics	Imp	Unit	Value
1,2,4,7,12	Accessories	3	List	USB cbl/case/cord/ earphone/ foil
6	Range	5	m	10
16	Battery autonomy	3	h	30
16	Battery condition warning	5	List	LED
1	Audio connection	2	List	2.5 mm jack
2	USB connection	5	List	MiniUSB
15	Power consumption	3	mA	100
1,15	Display dimensions	5	mm	64
17	Body attachment	3	List	Clip
12	Air humidity (working limits)	4	%	5 to 95
1	Interface languages	5	List	Por/Eng/Spa/Fre/Ger/Ita
3	Memory	5	kB	20
10	Disassembling method	3	List	Snap fit
5	Deactivation option	5	List	Buttons combination
4,9,13	Mass	5	kg	0.2
12	Temperature (storing limits)	2	ºC	-40 to 80
12	Temperature (working limits)	4	ºC	-20 to 60
16	Battery type	3	List	Rechargeable
1,15	Display type	5	List	TFT
3,6,16	Reading frequency	5	MHz	UHF
8	Vibration level	5	Hz	1,000 to 2,500
14	Audio level	5	dB	100 dBA 30 cm
11	Microprocessor	4	List	After software
7,11,18	Software	5	List	Tailored
4,9	Dimensions	5	mm	90 x 45 x 15
10	Physical reset	3	List	Switch

The translation of these user needs into metrics was made using the methodology proposed by Ulrich & Eppinger. Table 2 illustrates the main metrics defined and target values. For example, adaptability to users was related to display type and size, accessories, audio connection and interface languages. An USB connection and the matching accessory should enhance PC compatibility. Portability demanded smaller dimensions but also a convenient battery charger. Privacy required the existence of a headset to link into the audio connection, a deactivation option and the type of technology selected for the communication capability. The same technology along with reach was associated with the need for a reciprocal communication. Finally, ease of use was related to the device software and accessories supplied.

Some choices were influenced by cost (accessories, charger, deactivation, battery type), others were influenced by a better technical response to the needs (audio and vibration level, software, physical reset, battery condition warning). The concept generation phase followed the specification definition.

The VetusNet system is basically interactive. According to context or data classification to access, would mean differently. A protocol could be developed for each environmental situation, retaining a more generic structure. All groups of options should allow by default an activation option, deactivating in its absence and ensuring discretion. Memory and data management limitations demand

a few choices for each group, normally the frequent ones, putting the rest into "others". These groups, shown in Table 3, must emphasize the characteristics, interests, skills and potential of each person, helping to qualify them. For security reasons, classifications implying material wealth should be avoided.

Table 3. Example of group's options

Group	Options
Age	55-65, 65-75, 75-85 …
Agriculture	Pruning, horticulture, gardening …
Card Games	Belot, bridge, poker …
Civil state	Married, single, widow …
Computer Use	Internet surfing, games, chat …
Crafts	Crochet, knitting, sewing …
Dancing	Waltz, tango, samba …
Do-it-yourself	Carpentry, painting, plumbing …
Languages	Portuguese, English, Croatian …
Reading Preferences	Poetry, romance, tale …
Sex	Male, female
Singing	Klapa, fado, ballad …
Social Action	Blood donor, volunteering, boy scouting …
Sports	Gymnastics, golf, swimming …
Sports Support	Porto, Rangers, NK GOŠK Dubrovnik …
Work Interests	Agriculture, industry, services …

An example: User A is at the street and activates VetusNet. The system immediately starts to radiate the profile selected beforehand. Any other VetusNet device within range receives the information and starts to compare it with its own B profile. Suppose that both activated an interest in chess and fishing, along with others, unmatched. By recognizing this common interest, the device produces a discrete vibration and a display warning. There are four options possible: the red button rejects the signal, the yellow button accepts the signal without identifying yourself, the green button accepts the signal and identifies yourself and the blue button accepts the signal recognizing it as friendly.

Pressing one of the red, yellow or green buttons for three seconds (see Fig. 1) will allow an automatic response mode, according to the color chosen. So if red is pressed for three seconds it will reject every signal coming into the circuit. The yellow button can also work in an automatic, menu driven mode, accepting only specific programmed interests (e.g. languages spoken) or demanding two or more common interests to trigger identification. Data could only be processed when both users have made their choices.

When A and B chose a different color, discretion wins. Therefore if A rejects the signal and B accepts it, the result will be a mutual rejection. Once agreement is reached a contact can be established by several return methods we exemplify:

Yellow: e-mail address, mailbox, phone number, at choice, using an Internet database, linked confidentially to the chip number. A telephone support service could be an alternative. Anonymity is a must.

Green: as there is no will to keep discretion a waive will suffice, a word, showing the device. We propose the VetusNet gesture: a hand raised to the opposite shoulder.

Blue: this is a person we already know and wish to keep in contact. It is a friendly approach, identified by the display, with more personal data, as name or photograph.

SOS mode: asking for help if not visible or reachable (bathroom, alone at home, etc.). Obtained with the device on, by a three second action on an explicit SOS labeled lever with spring return. The same

movement achieves cancellation. The dual buzzer gives off a louder and intermittent sound and the system emits a distress signal automatically accepted by neighbor devices. The recipient's red button works as simple cancellation whereas the others send back an acknowledgement answer.
The product will be developed as a platform, with different derivatives, dedicated to persons with specific requirements. It would also be possible to transfer the potentialities of the system to the street, without the annoyance of a portable computer, unavoidable with PC based software systems. It should be integrated with public services, offering, for example, the municipality cultural week program, sports activities, celebrations, etc. In the business field it would allow the consultation of special offers, menus, bargains, etc.

Figure 1. VetusNet electronic device

As an innovation, as far as we know, the battery condition LED will be placed inside the "enter" button. It works also as a confirmation of a correct introduction as it is touched with the finger. The button set doesn't wish to be bounded to a "good design" conventional aesthetics. The colors, maybe too strong in the functional environment, will favor those with a weak sight, numerous according to our enquiry. Also the dimensions are bigger, trying to adequate to trembling and insecure hands. The same philosophy applies to the reset switch, inside the battery compartment. This seems preferable than the stylus-hole solution or two buttons pressed together. A ribbon with gripping properties was placed along the sides of the box, to aid handling quality. The audio output is concealed in the cavities of this band. Being an unstable surface it helps that it is never facing another muffling surface. The overall dimensions are similar to cell phones or PDA's we use everyday.
Being an entirely new product it was not possible to watch the user interaction. We can observe, however, that two of the main complaints in the enquiry were loneliness and lack of socialization. The contact network of the aged person is destroyed little by little. As time goes by mobility and acquaintances get scarcer, after retirement. VetusNet is meant to regenerate the lost contact capabilities and generate new horizons, keeping privacy whenever preferable.
Simultaneously the world suffers a deep change with the spread of information networks. As we watch the adaptation and evolution of products, services and mentalities, we noticed its limitations. The enormous information available leads to user disorientation. It looks like a road crammed with signs, outdoors, shop-windows and spots of interest, making it difficult to find the final destination. Not because it's not there but because we added new attention detours or the time is simply not enough for

an effective selection. The age adds new hindrances: unfamiliarity with new technologies, a smaller number of references and, typically, less patience, memory and concentration. Aged people tend to prefer simple things, reducing therefore the choice. It is expected that the present young generation will adapt, as they grow older.
On the other hand, with electronic database organization in progress, the traditional indexing services disappear, particularly those in public and commercial services. Various public services do not offer a paper alternative for catalogues and forms. These developments will increase the magnitude of noise in information. Concurrently viruses, worms, spyware, phishing and other software fraud phenomena are far from decreasing. It will reach new frontiers going along with new IT products. Maybe we will see, some years from now, a robot affected by one of these anomalies.

5. Conclusion

The design method used was an essential tool to approach a consumer universe none of us really knew. The product-planning phase was rich in opportunities for new products and we regretted some ideas couldn't be developed. At the customer needs identification phase the main difficulty was to put the questionnaire into practice, so that respondents conform to the objectives proposed, without preventing their liberty and creativity. Product specification, far from being a bureaucratic work, demanded common sense and organization as the completely new technological solution demanded concept testing and prototyping to be sure about our ideas. We've found that benchmarking related products was complex for an innovative product. An ingenuous solution was to take parts of differently related products so that each part could be compared.
As with any other methodology a rearrangement of priorities and looping tasks was inevitable. Workgroups don't ever work best but the disadvantage of higher entropy when disagreement situations arise is compensated by a quality of results unattainable by isolated workers. Essential was the tentative distribution of operative duties among group members and concentration on fundamentals as the deadline approached. Furthermore, by aiming the large, growing and fairly unattended elderly population, this exercise helped us to understand better what are their difficulties and aspirations, which can be used with future work.

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