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## When a robot turns into a totem: The RoboBeggar case

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### 1. Introduction

After her kingdom had been devastated by a prolonged famine in 1649, Queen Christina of Sweden commanded that wooden “beggar” statues be set up in the entrance of churches to collect money for the poor (Saariholma (a), 2001). Figure 1 shows two surviving examples of these wooden begging statues. These statues, known as “begging man/men” (*vaivaisukko* or *vaivaisukot* in Finnish), have slits through which donors are able to push coins. They continued to be used under the Russian domination of Finland and were, until a few decades ago, quite a common sight in the west of Finland where people still used them to deposit charitable donations. One hundred and eight examples of these wooden beggar statues are currently extant (Santaholma (b), 2001). Of these, only one, in the Lutheran Church at Soini (Etelämäki, 2000), has female features (Fides, 2002).



Fig. 1. Two wooden begging statues (*vaivaisukot* in Finnish)

A decision was taken with 3rd sector at the University of Joensuu in 2002 to research the potential of the RoboBeggar as a fundraising tool and to combine that research with the university's R&D program in the field of human-robot interactions. The initial design of the RoboBeggar prototype was limited in some ways by its intended similarity to historic Finnish *vaivaisukot*. It was in fact the original intention of the designers to construct a robot that the public would immediately recognize as being similar to the ancient wooden statues that were once a common sight in the porch entrances of Lutheran churches (Fides, 2002; Kouvolansanomat, 2001; Wanha, 2007). One of the aims of the research project was also to determine the extent to which the classical Finnish *vaivaisukko* that was used in earlier centuries to raise funds for charity might be replicated and modernized as a digitally controlled humanoid robot.

We devised a series of research questions to highlight the educational and technological advantages of the planned robot over the traditional *vaivaisukko*. Table 1 compares certain salient features of the traditional *vaivaisukko*, the RoboBeggar and two other electronic fundraising systems. The table elucidates how two fundamentally different technological fundraising systems illuminate specific issues and motivations in RoboBeggar research. Column 4 indicates the features of the online fundraising system (Online UNICEF) that is used by the United Nations Children's Fund (UNICEF) to raise funds to finance activities such as the construction of schools in Africa or to buy mosquito nets for people who live in malarial areas (UNICEF, 2007). Column 5 shows how the Securegive "Hercules" (2007), an automated teller machine (ATM) compares with the other systems when they are used in donation kiosks. The ATM Hercules has been used at various times by the Swedish Lutheran Church and The Swedish Church Mission (Svenska Kyrkans Mission) to receive and process funds for charitable causes (Palo, 2006; Terhema, 2006).

Feature/Function	Vaivaisukko	RoboBeggar	Online UNICEF	ATM Hercules
Interaction	No	Yes	Yes	No
Ease of donation	Yes	Yes	No	Yes
Ability to act as a reminder to donate	Yes	Yes	No	No
User learning support	No	Yes	Yes	No
Emotional appeal	Yes	Yes	No	No
Donor satisfaction	No	Yes	Yes	No
Donor encouragement	No	Yes	No	No
Ability to stimulate a repeat donation	No	Yes	No	No
Digital illiterate	Yes	Yes	No	Yes

Table 1. Comparison of four fundraising systems

Table 1 also highlights features that researchers need to include in a robot so that non-expert users might be encouraged to make donations. One of the axioms of this kind of research is that it is necessary to support interactions with online help (Mondi et al., 2007; Swan, 2004) so that users will be *encouraged* to donate while simultaneously being *rewarded* with some degree of personal feedback and gratification.

The physical dimensions and the appeal of the robot were dictated by the fact that the hardware had to be both *anthropomorphic* and *relatively small in stature* in comparison with the average human being. The height of the RoboBeggar was therefore fixed at 150 cm. The robot also needed to be able to collate information by means of visual, aerial and hypermedia devices that could create and process fundraising target data, statistics, graphics, sociological data, and other specific interactions. The robot also needed to be capable of giving e-learning feedback to users about fundraising targets and goals, the reasons for the fundraising, the targets fixed by the local community, and the reasons why it is ethical to donate money to help needy people. The design of the software was conceptually complex because it was necessary for the money-collecting functionality to operate in combination with the e-learning functions so that users could complete the donation process with ease. A full-graphic and intuitive donation interface was designed for this purpose. The use of “plastic money” (i.e. bankcards) added features to the hardware (namely a bankcard reader for donations), and these posed some interesting problems about the desired resemblance to the *vaivaisukko*. We also decided to give the anthropomorphic robot a female rather than male form even though only one female *vaivaisukko* survives in Finland. We justified this decision by pointing to the fact that it is mainly women who bear the material and occupational brunt of poverty in developing countries throughout the world (De Haan & Lipton, 1998; Hulme et al., 2001; Harcourt, 2001). And since the usability tests of the robot were mostly scheduled to be undertaken at fundraising events on behalf of developing countries, it seemed a natural choice to make the robot female in appearance.

In early Spring of 2004 the female (i.e. *gynoid*) robot called RoboBeggar (the term gynoid is derived from *gynē*, the Greek for woman, and the -oid suffix which indicates similarity in English) was tested in experimental circumstances in the Kupittaa Mall, an urban shopping mall in Turku (the main town on the southwest coast of Finland), which is frequented by a large number of users. The robot was set up to the one side of the walkway of the main hall of the mall so that it would be visible to and accessible by the thousands of people who shop daily in the Kupittaa Mall. The OP Bank Group (the largest financial services group in Finland, known by their acronym OKO) graciously cooperated by funding the basic transportation costs of the robot and by allowing the robot to be situated next to their bank in the Kupittaa Mall. The Cancer Association of South-West Finland (*Lounais-Suomen Syöpäyhdistys* or LSSY in Finnish) was designated as the beneficiary of the robot's fundraising activities.

In the paragraphs that follow we describe the basic architecture of the robot, the adjustments made to the software on the basis of experience, the logistics and agreements concluded for the conduct of the research, a description of how the robot was run. We also evaluate the effectiveness of the robot as a fundraising tool, undertake an analysis and evaluation of all relevant collected data and, finally, draw conclusions about what kind of procedures might work best in future interactions between human beings and fundraising robots.

## 2. The RoboBeggar architecture used in the Kupittaa event

The architecture of the robot in the Kupittaa event was essentially the same as it was in June (Faggiano & La Russa, 2004) and September 2003 (La Russa, 2009), with the main variations being the touch screen interface and the audio components. Figure 2 shows a schema of the robot architecture and its activity flow. The robot, which consisted of a combination of software (for internal and external operation management) and hardware, had the following components:

- (1) *The software.* The software manages and controls both the programmed behaviour and the communications that take place among the robot's components and between users and the transaction system. The e-learning module (*e-module*), which creates a connection between fundraising requirements and the necessity to heighten donor awareness, sympathy and response, presents a condensed version of essential information about the cancer organization that is the beneficiary, the disease itself, its incidence in Finland and the extent to which children are at risk of contracting cancer.
- (2) *The touch screen.* The touch screen is the interface between the users and the robot and presents the e-learning information in modular form. The touch screen gives users the option of selecting their preferred operation. The options are to donate funds, to be presented with more information or to close the transaction.
- (3) *The bankcard reader (or card reader).* The card reader is an electronic device that is capable of reading the magnetic tape of bankcards. If a user decides to make a donation, software transmits the information provided by the user to the bank. The bank then responds by setting up secure conditions for the transmission of data so that the user's donation can be received by the fund. The user is then given an opportunity to select the precise amount of the donation in a simplified window (see Figure 3 for details). The window allows the user to make a donation only in accordance with predetermined donation amounts (i.e. 1, 2, 5, 10, 20, 50 and 100 €). The RoboBeggar and the bank system are connected by means of GSM connection.
- (4) *The sound card and the speakers.* These are necessary so that the robot can talk and so give audible feedback to donors. The robot's ability to speak makes its resemblance to a humanoid more convincing.
- (5) *The printer.* The printer offers the donor a printed receipt which functions both as a receipt and as a reminder of the donor's charity. Although the printer is actually a constituent part of the bankcard reader, external separate equipment could just as well be used to produce better quality printouts.
- (6) *The micro controller and the servomotors.* The servomotors, which move the arms and head of the robot, give continuous feedback to the software about the latest position and situation of the robot. The servomotors are controlled by a programmable microchip (a micro controller) that receives orders from the software through a serial port. The software commands are "interpreted" in the micro controller and transformed into motor action. The RoboBeggar is capable of gestures that are correlated to the sound card and to a speakers' activity.
- (7) *The robot shell.* The shell, constructed from twelve bolted aluminium plates, provides the robot with a body to which the limbs and head are attached. The computer and its components, the micro controller and the loudspeakers, are all allocated space inside one of the two chambers into which the shell is subdivided. The shell can

easily be disassembled in its two constituent parts: the lower and upper sections (which hold the limbs, the head and the touch screen structure). All the servomotors are located inside the tubes that comprise the limbs and the neck with a total of 6 degrees of freedom (DOF). In engineering and mechanics (as well as in robotics), a *degree of freedom* defines the capacity of a rigid body to rotate on one of its axes or move along it (Zhang et al., 2007). Since rigid bodies have three axes, the maximum number of DOFs in a three-dimensional rigid body is 6. It is obvious from this that the DOF of systems such as robots can increase to a higher number (the human arm alone, for example, is considered to have seven DOFs).

Because the software is the core and heart of the robot, it needs to synchronize the robot's motors with its speech so that the robot's speech might appear to be as natural as possible. It also needs to take care of the e-module flow and to ensure that any bankcard's communication data will be transferred securely and efficiently.

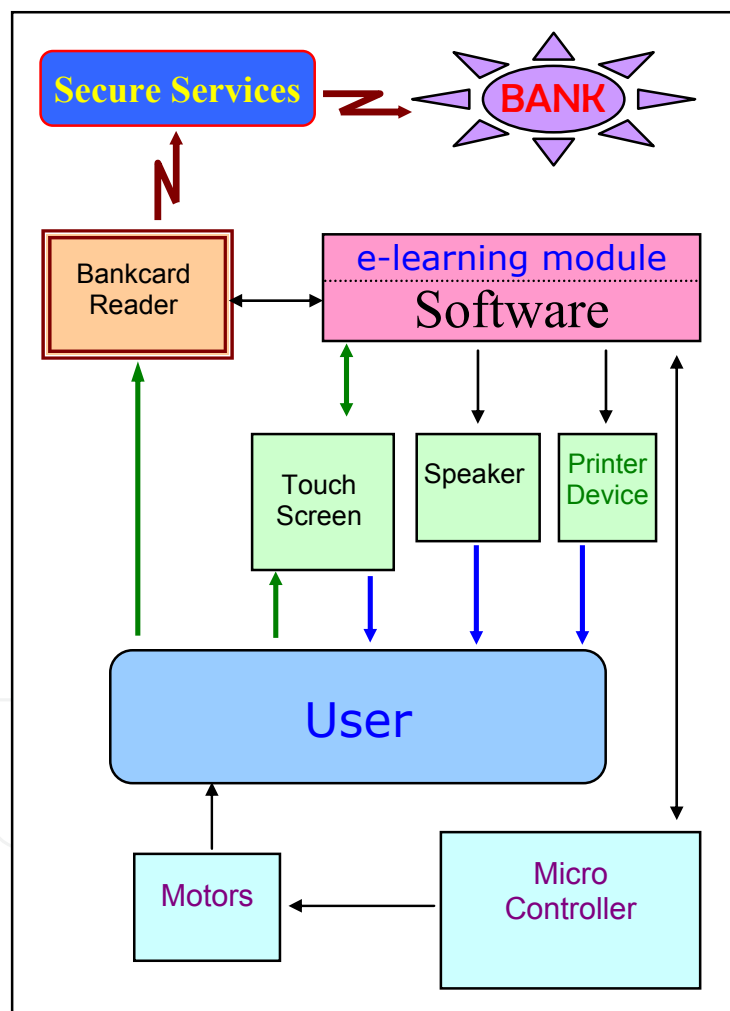


Fig. 2. The architecture of the robot and its functions

### 3. The RoboBeggar in the Kupittaa Mall experimental event

The choice of giving the robot a gynoid appearance was not motivated by sexist considerations but by the relative success of women in media and communication (Stratton,



2001). Because it has been proved that robots make a positive educational impact in learning environments (Pfeifer, 1997; Miglino et al., 1999), the gynoidal appearance of the RoboBeggard should be considered to be a compromise between an indigenous Finnish tradition (Santaholma, 2001; Fides, 2002; Etelämäki, 2000), technology (Naidu et al., 2002; Papert & Harel, 1991; Vo et al., 1995; La Russa et al., 2004) and sociological studies that privilege and showcase the role of women (De Haan & Lipton, 1998; Hulme et al., 2001; Harcourt, 2001).

### 3.1 The robot interface

Because the user interface had to be as simple as possible (Marwedel, 2003; Cooper & Reimann, 2003) while offering a highly intuitive interface for the e-learning module (Norman, 2002), the LSSY was asked to express their preferences about the style of graphic interfaces and the information that they would present to prospective donors. Because LSSY is experienced in fund-raising activities and possesses accurate information about their average user interaction time (estimated to be approximately 60 seconds for the human-robot interactions) (Card et al., 1986), the e-learning module was reduced to four basic informative windows (see Figure 4, 5, 6 and 7) with additional direct access to the iconic window that mediates the donation activity (see Figure 8). Three other windows were dedicated to the human-robot introduction (the welcome window – see Figure 3 for the template) and the donation process (see Figure 9 for an image of the bankcard reader information window). The remaining (final) window of the donation process thanks the donor with a text that is randomly extracted from a list of twenty possible choices.

The use of the euro icons was dictated by the fact that it is necessary for users to be well-informed about the size and value of the monetary value of the donation that they intend to make (Huang et al., 2002) – in spite of the limited time at their disposal for making a decision. The euro icons make it easy for a donor to choose the size of the donation according a progressive ascending value order from left to right and top to bottom. The icons were also visually weighted and distributed in the iconic window in accordance with their representative values (see Figure 8).



Fig. 3. The welcome window template



Fig. 4. The main LSSY window which introduces the *campaign to eliminate cancer*

The frame of Figure 4 reads “*Voluntary Work to Fight Cancer*” (*Syöväntorjuntatalkoot* in Finnish). The buttons are programmed with the following links:

- (1) “*Syöpä?*” (*cancer*) leads to the e-module “*Syöpä lyhyesti*” (*in brief about cancer*). See Figure 5.
- (2) “*Lasten syövät*” (*kids’ cancers*) leads to the e-module “*Lasten syövät*” that is shown in Figure 6.
- (3) “*LSSY ry*” leads to the descriptive e-module of “*Lounais-Suomen Syöpäyhdistys*” organisation (*The Cancer Association of South-West Finland*) that is shown in Figure 7.
- (4) “*Takaisin*” (*back*) is for going back to parent e-module.
- (5) “*Käyttöohjeet*” (*instructions*) leads to the system usage information e-module. In the other e-modules this button is substituted by “*Lahjoittaa*” (*make a donation*) which straightly leads to the iconic window of Figure 8.

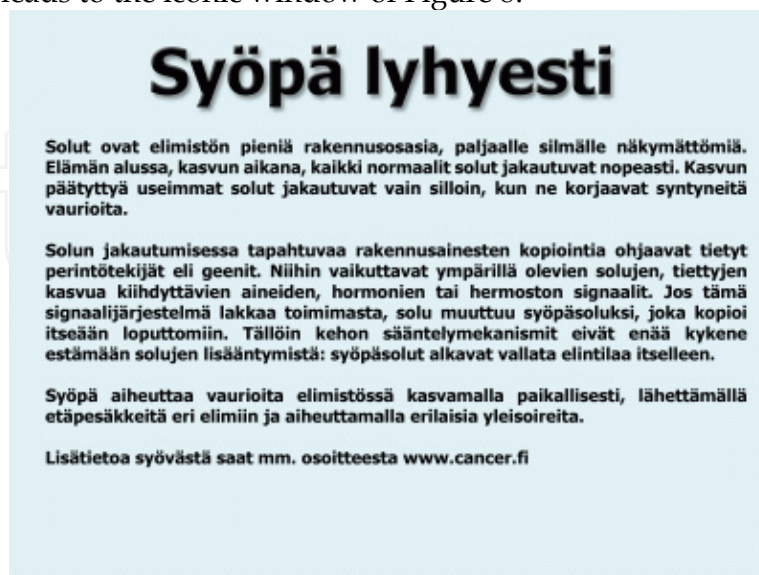


Fig. 5. A brief overview *about cancer*





Fig. 6. An explanation of how *Children get cancer*

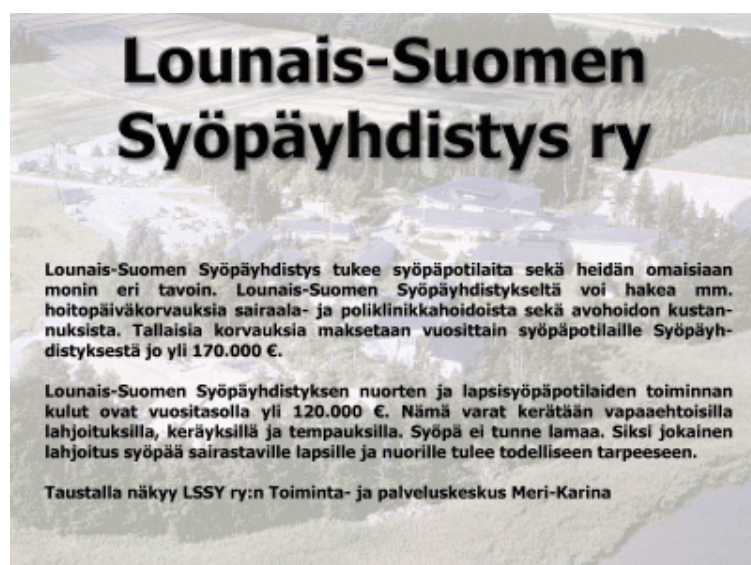


Fig. 7. The window describing the *Cancer Association of South-West Finland*

The *iconic window* of Figure 8 informs the user of the opportunity to donate a given amount of money by touching the correspondent monetary icon. It also tells that after having chosen a donation value a new window (see Figure 9) will guide through the bankcard operation to complete the donation process which would be confirmed by the robot. The confirmation is given via receipt printing and a final informative e-module containing the donation data (the current user's donated amount as the overall donated amount), some extra activity hints and the verbal thanking of the robot.



Fig. 8. The *iconic window* controlling the donation process



Fig. 9. The bankcard reader information window with written instructions

### 3.2 How the RoboBegger was used in practice

The LSSY was entrusted with the care and public management of the robot for a period of two weeks in late February 2004, and as much information as was considered necessary was given to the representatives of the bank and the cancer organization about the software and hardware of the robot. In addition to this, the robot's software was simplified compared to previous usage events because it was too expensive for the robot's designers to manage the robot directly themselves (the distance between the research institute and the mall was about 600 km) and because there were no available local robotic technicians to undertake the task. The designers therefore automated the uploading of the robot software to coincide with the initialization of the computer system so as to obviate as much as possible the need for any kind of direct administrative management of the robot.

The economic need to create a partly self-managing robot that was not under the direct control of the academic staff nevertheless created some unexpected consequences that gave its designers additional socio-cultural data that they were obliged to take into consideration when considering how they might modify the robot to cope the range of likely human-robot interactions in the future.

### **3.3 Data and feedback information**

The robot, suitably attired in woman's clothing, was eventually carefully positioned next to the OKO Bank on the one side of the main hall of the Kupittaa Mall. From that position it was possible for the bank's employees to observe and monitor what was happening to the robot from their own work stations. The robot was switched on in the mornings and off in the evenings by means of an electric cable that was connected to the main power supply of the bank. Members of the LSSY organization volunteered to stand near the RoboBeggar so that they could help and encourage passers-by to approach the robot and begin a human-robot interaction.

On the eve of the usage period the research team assembled and tested the robot in situ in Kupittaa Mall and briefed those members of the bank's staff who would be involved in the care of the robot with whatever they needed to know about the running of the robot (such as its activation and deactivation, and its stability). OKO Bank also took responsibility for maintaining the integrity and safety of the robot. The management of the RoboBeggar was then handed over to a representative of LSSY, and everything looked fair for full use and data collection starting the following day. The robot was positioned with its back to the bank and its front toward the mall pathway. This was the prelude to two weeks of testing and fundraising that would follow.

What follows below is a description of the event feedbacks that were obtained from three different sources: (1) the OKO Bank's employees, (2) a local newspaper article, and (3) the Multiple Choice Question forms that were intended to be offered to donors.

### **3.4 Feedback from the employees of the OKO Bank**

Three employees of the bank reported the following information during the course of interviews:

- (1) For unknown reasons and at unpredictable moments the robot would stop functioning. This made it necessary for the LSSY attendees to restart the robot's program by unplugging and then plugging in the power cable again.
- (2) In the first few days tens of people interacted with the robot and made donations through the medium of the robot.
- (3) Even while the robot was functioning, hundreds of people approached the robot and the LSSY attendants because the RoboBeggar's had attracted their attention with its rather distinctive voice calling from the speakers (the axis of the pathway in the mall was only about ten meters away from the place where the robot stood).
- (4) Fewer than twenty people experienced difficulty in sliding their bankcards through the bankcard reader slot at a speed that would allow the magnetic tape to read the data on the bankcard. Sometimes this operation had to be repeated to be successful and sometimes people turned to make a cash donation directly to the LSSY attendees who were armed with donation tins.

- (5) There was a distinct increase over the period of the experiment in the number of people who were attracted by the RoboBeggar and who approached it either out of curiosity or to make a donation.
- (6) After about a week the LSSY volunteers decided to keep the RoboBeggar switched off and resorted to collecting money by using only the LSSY donation cans. They did this because they said that the robot had already become known to the users of the mall and because many of them were approaching the robot before it had even called them. The LSSY volunteers also eventually concluded that it was easier and simpler for them to collect money directly in donor boxes than to wait for users to complete the interaction processes. In the meantime an additional vest that displayed LSSY fundraising information (see Figure 10) was placed over the robot's chest.
- (7) During the sixteen days of the fundraising experiment, many hundreds of people came over to examine the RoboBeggar and to ask about its function, and these people collectively donated thousands of euros to the LSSY organization.

### 3.5 Feedback from the local newspaper

During the experiment the local *Turkulainen* newspaper published an article (Pitkänen, 2004) that described the fundraising robot and offered opinions about its functions and usability. The picture in Figure 10 accompanied this article and it is reproduced here with the permission of the newspaper. The article highlighted the following points:

- (1) People perceived the gynoid as a charming lady with green eyes that focused on passersby. (Author's note: For this experimental event, the robot had been repainted for a third time. This inspired the research team to consider the possible future use of intelligent tissues, which are substances capable of reproducing humanoid skin-like behaviours.
- (2) The calling voice of the robot proved to be so effective in attracting people that its volume had to be reduced. Many passersby became alarmed because they thought that a real person was in some kind of trouble and approached the robot area offering their help.
- (3) The robot had very good manners and would thank people courteously for their donations.
- (4) The use of "plastic money" was a necessary component in the fundraising campaign because many people who did not carry cash wished nevertheless to make donations.
- (5) The robot offered people a choice of beneficiaries for their donations (i.e. they could specify whether their donation should be diverted to child or adult care).
- (6) The robot was not capable of carrying out a conversation (dialogue). It was evident that donors had an emotional need to tell the robot about their own experience of cancer.
- (7) The robot was occasionally switched off.
- (8) LSSY attendants supplemented the fundraising activities of the robot.



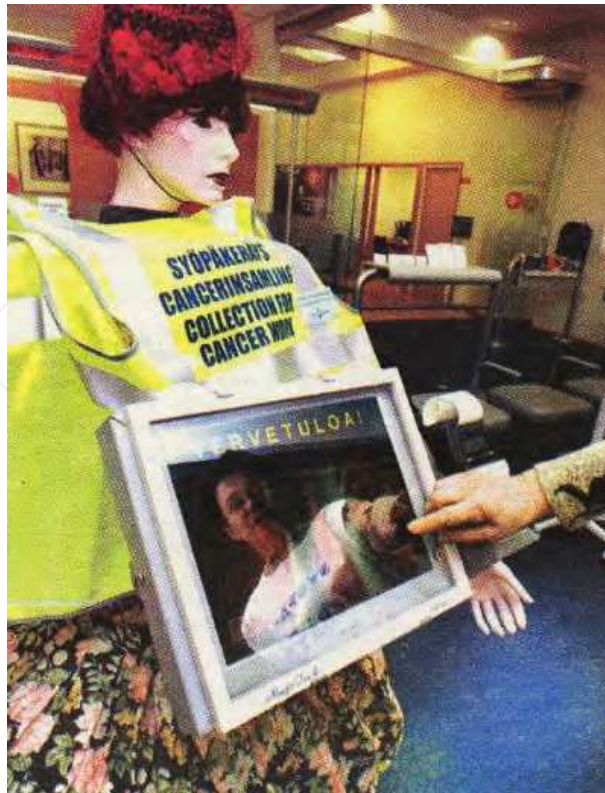


Fig. 10. The RoboBEGGAR in its LSSY vest (still in active mode)  
 Photograph reproduced by kind permission of the photographer, Pasi Leino.

### 3.6 Feedback from users

A Multiple Choice Question (MCQ) form was designed to be offered to people who approached the robot and who had initiated an interaction process. The form was intended to provide the researchers with additional data for analysis and evaluation. The information collected by the form related to:

- (1) Gender
- (2) Age group
- (3) The functionality of the robot (seven questions)
- (4) The effectiveness and influence of the robot (four questions)
- (5) User evaluations and assessments (five questions)
- (6) The donation system application (four questions)
- (7) A blank space for any additional messages to the researchers and/or the designer of the robot (users were instructed by a message in bold letters at the bottom of the front of the form to write any additional personal contributions on the reverse side of the form).

According to the type of question being asked, users could respond in one of two possible ways (Uebersax, 2006):

- (1) They could express their opinion in terms of the following scale:
  - 1 = completely of different opinion
  - 2 = partially of different opinion
  - 3 = it cannot be determined
  - 4 = partially of the same opinion



5 = fully of the same opinion

(2) They could choose one of the following three options:

No

It cannot be determined

Yes

Only five multiple-choice feedback forms were returned to the research team by the LSSY volunteers at the conclusion of the fundraising test campaign. The reasons for this poor feedback are explained in the following section.

#### 4. Analysis and assessment of the data material

It was a defect in the research design that the LSSY volunteers focused mainly (if not solely) on fundraising to the exclusion of a prior agreement also to collect research data. The research element would have involved them in encouraging users to fill in the feedback forms which were designed to provide vital information about the way in which the RoboBegger was being used. If a similar misuse of the robot is to be avoided, communication between the research institute and the LSSY needs to be much more clear and unambiguous. If communication had in fact been clearer before the test event, the necessary users' feedback information would have been collected (Pitkänen, 2004).

The feedback that was collected provided a variety of data relating to different aspects of how the robot was used and how users approached it. The feedback obtained comprised 75 answers to questions about the quality of the robot's functions and its efficiency, and 15 expressions of personal opinion. The analysis in the graphics in Figures 11, 12 and 13 are presented as percentages of the related data population. Most noteworthy among the results is the following feedback obtained from an analysis of user responses (set out in comparison with results obtained from a previous test event in June 2003 (La Russa et al., 2004) :

- (1) When users were asked to express an overall opinion about the functionality of the robot (the user interface, the donation process, the provided information, etc.), 74 % of their replies pointed out that it had been totally successful, and 23 % that it had been successful (see graphic in Figure 11). In a previous test event carried out by La Russa (La Russa et al., 2004), the corresponding values had been 78 % for totally successful and 15 % for successful.
- (2) When asked their opinion about whether the robot was successful in its interactive tasks, 80 % of responses were yes and 20 % were no (see Figure 12). In the previous test event, 94 % of the answers were yes and 6 % were unsure.
- (3) In response to a question about whether the robot had been successful in creating a "fun" situation, 40 % of the answers indicated that it had been totally successful while 60 % indicated that it was successful (see Figure 13). In the previous research event by La Russa, the corresponding values had been 78 % for totally successful, 14 % for successful, 4 % for unsure, and 4 % for totally unsuccessful.

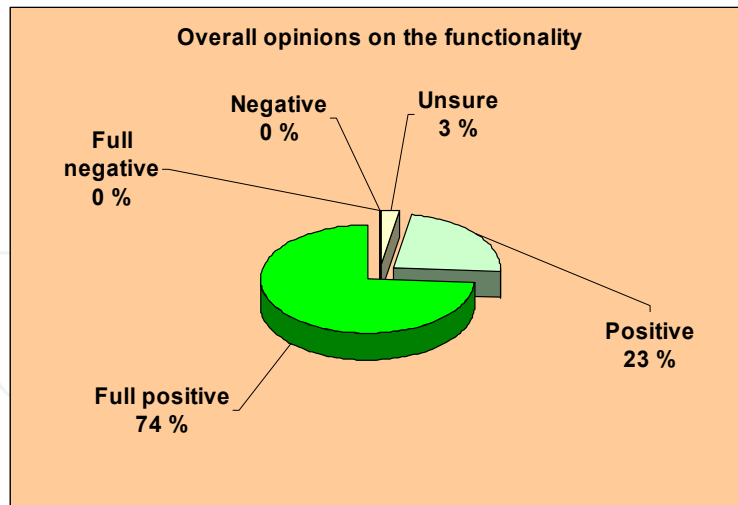


Fig. 11. Users' assessments of the robot's functionality

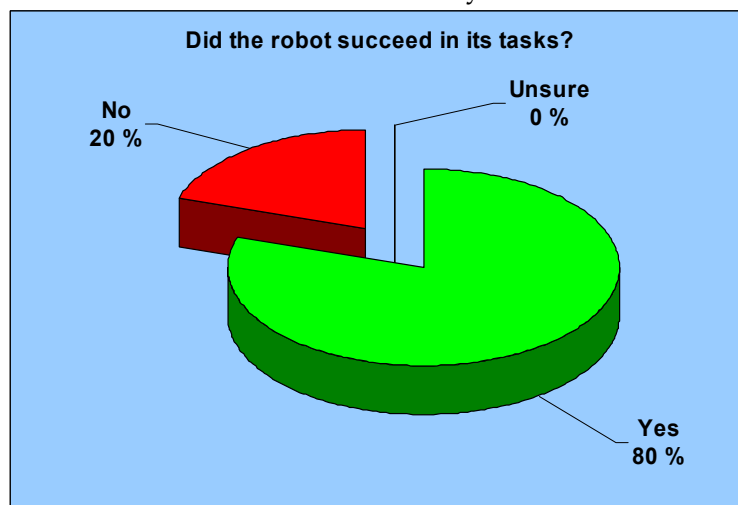


Fig. 12. Users' assessments of the robot's success in carrying out its tasks

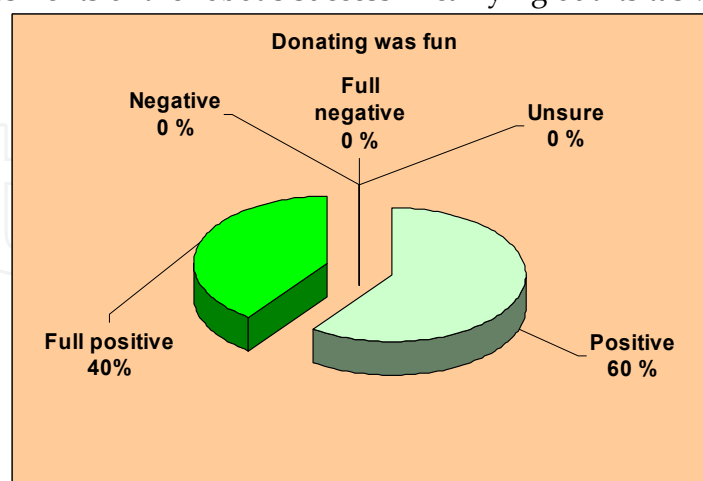


Fig. 13. The extent to which users enjoyed using the robot to make a donation

The researchers introduced a new set of questions for the Kupittaa Mall test event to evaluate users' perceptions and their appreciation (or otherwise) of the robot's donation

system features. Figure 9 displays the results (45 % of the answers were a global positive response and 35 % a global negative response).

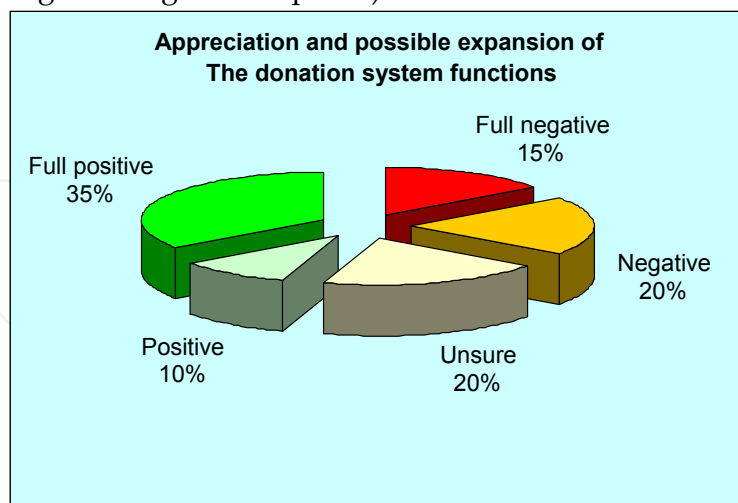


Fig. 14. Users' appreciation of the robot's donation system application and potential for expansion

The feedback obtained from participant OKO Bank employees and the *Turkulainen* newspaper tended to be in agreement: users initially perceived the robot as a living being and then, when it had become inactive, as a catalyst for emotional reactions and conceptual creativity.

## 5. RoboBeggar as a digitalized totem

It was noticeable that the robot had so stimulated a number of passersby that they wanted it to act as a confidant with whom they could verbally share their experiences. The emotional reaction of people towards the robot was in fact so strong that many experienced it as *almost* human (Pitkänen, 2004). The calling voice of the robot was so successful in attracting the attention of passersby that many felt compelled to come to its aid (they assumed that the robot was in fact a person in trouble and they came to question the LSSY volunteers about its function).

During the first week of the fundraising campaign the robot made a strong social impact on passersby who knew about its presence, purpose and role as a technological agent for raising funds for combating cancer. The RoboBeggar had thus in fact become a successful catalyst for collecting funds for the fight against cancer. Even after the LSSY had switched the robot off, the RoboBeggar continued to create a strong *momentum* as a catalyzer or emotional totem that served the interests of the cancer-fighting organization (Gareth, 1997). The LSSY participants *adopted* the robot by dressing it as one of their volunteers and by using its undoubted attractiveness to encourage people to make donations (Figure 10 shows the striking yellow LSSY vest with which the robot was clothed). The existence in people of unconscious ideations that can be concretized in, for example, symbols or totems has already been widely studied in psychological, sociological and educational research (Starr-Glass, 2004; Fiske & Fiske, 2005). The Merriam-Webster's Dictionary defines **totem** as *an object (as an animal or plant) serving as the emblem of a family or clan*. This definition implies that the RoboBeggar achieved the status of a totem.

Despite occasional failures in the technological functioning of the RoboBeggar, valuable information was nevertheless collected from the three means of feedback about donor behaviour and attitudes towards the robot. That data confirms that the robot's humanoid appearance and verbal skills were successful in affecting the emotional and cognitive behaviour of the people who came into contact with it. After it had been there for a while, the robot even began to assume a living role in the imagination of people who frequented the mall. People accepted the role of the robot as a catalyst in the campaign against cancer and as a means that people could use to make donations to combat the disease. In other words a purely technological robot was accepted by people and transformed into a highly emotive social totem.

## 6. Conclusions

Despite some unwanted and unforeseen conditions and events, the robot RoboBeggar received mainly positive reactions from users with regard to its functionality, its interactive tasks and its ability to create fun and amusement during the interactive learning process. The robot was successful in its essential fundraising and supportive purposes.

An analysis of the assembled data (from interviews, the newspaper article and from user and participant feedback) highlights the reasons why and the mechanisms by means of which the robot was transformed into a social totem that elicited some highly emotional reactions. It is apparent that the humanoid appearance of the robot and its verbal skills and appeal were among the main elements that elicited emotional responses from people and influenced their subsequent behaviour. This research tends to confirm that it is through the agency of human imagination and perception that a robotic tool (in our case, the RoboBeggar) can be transformed into a totem of social value and effectiveness. It also became clear to the researchers that it is not only design and implementation that are important for the successful operation of a fundraising robot but that the robot's self-presentation and social aura are also crucially important factors for an overall understanding of why such a robot may be successful. The test case conducted in the Kupittaa Mall clearly shows how presentation and social aura compensated for the partial failure of the RoboBeggar's implementation. It is also clear that interpersonal and cultural elements influenced the way in which people perceived, accepted and responded to the robot as a potential personal interlocutor.

It is now clear that future developers of this model might do well to look at the possibility of technological improvement in the interface and e-learning modules. It is also clear that additional studies are required to investigate the emotional and psychological responses of users to advanced technological equipment that elicits emotional responses in human beings. It is also fundamentally important to be able to define exactly how influential both the hardware and software are in human-robot interactions so that effective guidance can be given to the designers of anthropomorphic robots of this kind. It is also important to be able to define the effect that particular physical environments and locations have on the efficiency of a humanoid robot's function so that it will be possible to place a robot in optimal situations for interacting with human beings.

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