

Researcher:	Chandimal Jayawardena
Project Title:	Robotic chair for remote cardiovascular risk assessment
Project Code:	RI12005
Date of Report:	27.03.2013

Please delete the instructions in italics prior to submitting your report.

Executive Summary

Summarise highlights of the project, including aims/objectives, overall approach, findings, achievements, and conclusions.

The objective of this project was to develop an intelligent robotic chair for cardiovascular risk assessment. The first prototype of the chair is currently in the technical testing phase.

This robotic chair can engage users (patients) using human-robot interaction strategies and help them improve their cardiovascular risk. It measures several clinical parameters within a short period of time, by providing appropriate instructions to the user. Collectively these measurements can be used to provide a comprehensive assessment of the severity of heart failure symptoms, and this information may then be used to guide management and avoid hospital admission.

This product may be particularly advantageous in remote locations with limited access to secondary and even primary health care. It will allow remote cardiovascular risk assessment and patient management. It will also be a very useful tool in waiting rooms in clinics. In addition, it will upload vital signs data to the information system of the clinic, thus saving nurses' time.

In addition to that, the robotic chair can provide mobility support as well.

Background

Summarise the background to the project, the need for it and why it's important.

Heart failure is mostly managed in the community and is as present in rural populations as it is in urban centres. Some patients live very far from main hospital services and a device that can detect the early precursors of symptomatic deterioration will be enormously useful in remote locations and in the home. This product has a potential to be commercialized and it may create an export business for New Zealand.

Aims and Objectives

List the aims and objectives of the project and note if they changed during the project.

According to the funding application, the project goals are as follows:

1. Designing a robotic chair
2. Building a prototype
3. Conducting technical tests
4. Conducting pilot tests
5. Conducting acceptance tests
6. Writing publications

There were no variations to the above goals during the project; but there were some delays. Therefore, currently the project is in technical testing phase.

The main reasons for the delays were lack of laboratory facilities, lack of equipment, and lack of capable research students. Through rigorous efforts of the research team as well as through the support of the department, solutions have been found to most of these difficulties and currently the project is continuing well.

Methodology

Summarise the overall approach taken and why this approach was chosen over other options considered.

The overall approach taken is given below.

1. Background and related work
2. Design and implementation
3. Technical testing
4. Pilot testing
5. User acceptance testing

Outcomes/findings

Explain the end result of your research. Did you achieve against the aims and objectives set? Depending on the project, it might include research results, findings, evaluation results, data, etc. If the project created something tangible like software, an artwork or a piece of equipment, describe it.

There were two main expected outcomes of the project.

- (1) Developing a robotic chair that can be used for cardiovascular risk assessment and as a research platform for further research.
- (2) Publications.

The first expected outcome was successfully achieved. Currently, two undergraduate students, one doctoral student and a research assistant are conducting further research using this platform.

However, the second outcome is yet to achieve. The project team had to face numerous challenges to achieve the first objective and could not devote sufficient time for writing publications. However, since the product is completed now, the second objective (publications) can be achieved soon.

Conclusions

Briefly summarise any conclusions that can be drawn from the research.

The main conclusion that can be made at this stage is that this type of high-tech projects can be successfully conducted at Unitec by Unitec staff and students. Although the project is not completed yet, the current version of the prototype is sufficient to conclude that.

Secondly, this project enhanced student experience in multiple ways. Some students directly joined the project. Many others became aware of the project and were influenced by the project. In addition to that, a few sub-projects that can be used as student project were created around the main project.

Third, this project influences teaching and learning as well. The principle investigator of the project used certain parts of the project in two courses; software architecture (level 7) and health informatics (level 8).

Fourth, the outcome of this project is a tangible product, which has a potential for commercialization.

Finally, the essence of the robot chair project is to address a pressing need of the society. In many countries, as well as in New Zealand, there are regions with less resources and poor medical facilities. Once the robot chair is completed, it can be used to uplift the quality of life of people living in such areas.

Implications

Indicate who will benefit from the research, how, and why. Consider the future implications of your work and how others can build on it. What are the implications for other stakeholders, for users, or for the community? What work could be undertaken to build on your research or carry it further?

This research has multiple effects on New Zealand society. Key effects are given below.

a. Remote cardiovascular risk assessment and control: This robotic chair can help people to control their weight by giving interactive feedback by assessing the current risk. It also analyses the past data and trends.

b. Solution to decreasing workforce: This robotic chair can be used in a doctors' waiting room or in a hospital clinic to measure vital signs and to ask preliminary diagnostic questions. This will ease the workload of nurses.

c. Better user satisfaction and active involvement in the healthcare processes: The chair will be able to provide valuable health information to the user including his/her own medical record, educational materials, advices on medication etc. This will increase the user satisfaction and the user involvement in the health care processes, rather than being a passive client.

Recommendations (optional)

List any specific recommendations for the teaching, learning, or research communities.

Publications and dissemination

Provide specific details. Include internal dissemination (eg participation in Unitec's Research Symposium). If these differ from those anticipated in your original application, please explain.

A presentation was made at the Unitec Research Symposium, 2012 as planned. However, other publications are still pending due to the reasons mentioned above.

Financial Reconciliation

- *Comment on the final status of your project's budget, including the reason for any underspend or overspend if applicable (NB: it is not anticipated that you would have overspent your budget).*
- *If your expenditure does not match the final income and expenditure statement produced by PeopleSoft, provide an explanation for the discrepancy.*

The project budget was carefully tracked throughout the project duration and the project team believe that the budget was well spent. The following figures are based on the peoplesoft report.

References (if applicable)

List any references to the work of others you have cited. Provide URLs for any materials available on the web.

Appendixes (optional)

Include any appendixes that readers will find helpful to understand the work described or the results.