

**LOCATION**

Cambodia

**PARTNER**

DEVELOPMENT TECHNOLOGY WORKSHOP, UK

Established in 1995, the Development Technology Workshop is a UK-registered charity which seeks to promote technical development in poor countries through the establishment of sustainable manufacturing enterprises. It has worked primarily in the local production of equipment for landmine clearance, and wherever possible, employs disabled people.

**SUMMARY**

The project seeks to increase access to communication for blind people through the improvement of a prototype, low-cost mechanical Braille writer that is suitable for local manufacture and repair by staff trained to higher skills levels using improved resources.

**PERIOD OF FUNDING**

June 2001 to February 2003

**GRANT**

£49,075

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# An appropriate, low-cost mechanical Braille writer

**BACKGROUND**

Most of the estimated 45 million blind and visually impaired people in developing countries around the world are unable to read. The reason for this is the lack of written materials printed in Braille, the system of raised dots that enables blind people to read. In the words of the **World Blind Union**, Braille serves as “a building block to literacy, independence and successful employment”, but “in the developing world there is widespread ‘starvation’ of the most basic Braille materials”.

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Much progress has been made in the mass production of Braille material using computer and embossing technology, but it will be a long time before many people in developing countries such as Cambodia have access to this technology. The **Development Technology Workshop (DTW)** received KaR programme funding to develop an alternative, low-cost mechanical Braille writer. This will reduce the detrimental effects of blindness and visual impairment on poor people by enabling them to have better prospects in education, employment and leisure activities.

**THE PROJECT**

The project started in July 2001. All design and fabrication work was carried out in DTW's workshop near Phnom Penh, Cambodia, with the involvement of the **Association for the Blind in Cambodia**. The first DTW Braille writer was based on a simple wooden machine built by the **Pearson Trust** (a UK charity). During the course of the project there were four cycles of development and prototyping. Relevant organisations in **Cambodia** and **Kenya** evaluated the Mk 4 prototype machine, and their feedback was incorporated into the final design.



DTW

Existing mechanical writers are extremely reliable and capable of consistently producing high-quality Braille. The new design aims to match these criteria, while reducing the complexity of the machine and making it suitable for manufacture in developing countries. In addition, the

maintenance and repair of the writer should be possible with a minimum of technical skills and equipment. The final aim is to achieve an overall production cost of US\$70 per machine, which would compare well with existing machines, typically costing more than US\$600.

The last prototype, the Mk 5, is currently being built and ten prototypes will soon be ready for testing. Encouragingly, it is clear that the machine is capable of producing high-quality Braille, using relatively simple mechanisms and manufacturing processes.

## LESSONS LEARNED

■ It is important to use existing technology where possible. It would be difficult to develop a functional Braille writer which did not use existing, tried and tested design features, such as key pressure, which is much the same on all commercial models.

■ The Braille writer has a carriage that carries the paper and moves from left to right as the lines of Braille are formed. On the earlier DTW models, non-rolling element slides were used in an attempt to keep costs down and in the interest of simplicity. While the resulting mechanism worked, it did not have a consistent quality because it was difficult to get a smooth movement. The last design is a good compromise, using a simple, round-bar slide on one side of the carriage, while the other side of the carriage is supported on a small roller bearing.

■ Braille letters are formed by a combination of six dots placed in a vertical three by two matrix. Earlier development models would produce one, two and three dots very well, but dot quality would decrease when attempting to produce four, five and six dots simultaneously. The reason was that the light aluminium chassis of the earlier DTW Braille writers would flex – by perhaps one 100th of a millimetre – when required to form more than three dots simultaneously. This movement was magnified by the distances between the keys and the dot-forming head, and resulted in a loss of pin pressure on the paper and poorly formed dots.

This problem has been overcome in the latest design by using castings for the chassis and reducing the distances between the keys and the dot-forming head.

■ The Braille-forming pins on earlier DTW prototypes were arranged to come in from the side as the appropriate key was pressed. The mechanism worked reasonably well and was constructed from simple components. The major drawback was that it had too many moving parts, and when operated at speed the pins did not move quickly enough, resulting in missed dots.

The problem has been addressed by having the pins move vertically upwards. The distance the pins now move is much shorter, and the response is much faster.

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## FUTURE PLANS

The aim is to start commercial production of the final design in 2003 in Cambodia to serve the south-east Asian market. Later it is envisaged that other regional manufacturing workshops will be set up to cover production, maintenance, repair and operation based on the Mk 5 and its manuals. There is already a strong interest in Kenya.

Small enterprises involved with Braille writer production will also be encouraged to manufacture other equipment for blind people. To this end, DTW has already developed a folding walking stick and is proceeding with a pocket Slate and Stylus (a simple device for producing short Braille notes that can be carried in a pocket – the blind person’s version of a notebook) and an abacus counter. These extra products would broaden and strengthen the production base for the small enterprises.

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