

DEVELOPMENT AND COMMERCIALIZATION OF AN ERGONOMIC GARDEN SEAT

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ABSTRACT

This paper describes the development and commercialization of a product designed with ergonomics and universal design in mind. The design team brought expertise in designing job accommodations and seating for people with disabilities to bear on the task of gardening. A cross-functional team with expertise in different areas carried out product design, market research and design for manufacturing activities concurrently, resulting in a successful product launch six months from the signing of a licensing agreement.

BACKGROUND

Products developed with ergonomics and universal design in mind are easier to use and more comfortable for a wider range of people. Still, most companies consider it an extra expense, and continue to design their products to fit the 80% of people falling within the “norm”(1). Innovation of this sort typically comes from a universal design “champion” in house, or from an outside source. Companies more open to such ideas include those which think of themselves as innovators, or those which already carry ergonomic tools. In order to “sell” a product to a potential licensee, it is best to approach them with functional and aesthetic prototypes, market research information showing high consumer interest in the product, and information on the manufacturing and cost of goods(2).

STATEMENT OF THE PROBLEM(S)

Design problem: Gardening is a very popular form of recreation with participants of all ages, extending into retirement. Many people over 35 experience knee or back pain, making it painful to garden extensively. Unless working on raised beds, a gardener must be close to the ground. Getting down to the ground, kneeling, working in a forward leaning position and getting up can all cause pain. Existing equipment designed to help gardeners provides some relief, but often puts stress on their knees and/or back while working from a kneeling or seated position. The goal was to design a supportive aid for gardening that facilitated good body mechanics and posture, simultaneously reducing stress on the body and enhancing functionality.

Commercialization problem: Companies will not license products unless it appears highly likely to be profitable. A high profit margin requires a large sales volume and a low cost of goods relative to the price the customer is willing to pay. Market research needed to be conducted concurrently with product development, identifying the target market, determining an acceptable price, determining user specifications, testing the design with end users, and gathering data that supports its appeal. Exploring manufacturing alternatives early leads to design decisions affecting cost positively. Companies are more apt to license a patented product, as it offers a barrier to entry for competitors.

RATIONALE

As stated above, existing solutions do not do an adequate job of reducing the pain of gardening. Existing equipment includes kneeling pads, knee pads, combination kneeling/sitting platforms, seats with wheels, and buckets with lids. When using kneeling pads, although the knee is cushioned, the force on one’s knee joints and patellae is still problematic, increasing as a person leans forward. The significant downward lean required with most seat options puts the lumbar region in a great deal of flexion. Stationary garden seats and seats on wheels become unstable as one leans forward

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and down. Units with seats on wheels tend to limit the placement of one's feet, can be unstable on sloping ground, and don't necessarily move easily with a person on it. The need for a comfortable support that remains stable while facilitating movement and improving reach was the challenge.

The scope of issues one considers when developing a product for commercialization are compounded beyond the "Design Problem". Some additional considerations include: cost of manufacture, impact of materials and manufacturing on the environment, marketability, aesthetics, consumer appeal, liability, tooling costs, critical timing for the market, prior art, patent status, packaging, point of purchase displays, shelf space, and shipping considerations.

DESIGN

The Garden Rocker (Figure 1) was designed to work for a broad range of people. The basic components are a convex base, adjustable height seat post, and contoured seat pan. The design allows it to be used either in a seated position or with one or both knees in contact with the ground. The contour of the forward section of the base allows the gardener to tilt forward and to the sides and to rotate. The semi-flat area that extends from the center to the back of the base provides stability in the upright position and resists rearward tipping. The unit remains stable as the gardener leans, with their feet/knees and the base providing three points of contact at all times. Their buttocks remain in contact when leaning, offsetting some of the body weight. The seat contours, padding, and covering distribute pressure for comfort and to resist sliding when the seat is inclined. Handles were designed as an option for people who want assistance sitting or rising. The base provides some storage, and an accessory pad with side pockets for tools was developed by the licensee.



Figure 1. Garden Rocker

DEVELOPMENT

The initial design presented to the project team was reminiscent of a one-legged milking stool. The disadvantage of using a stick-like base in soft ground and consideration of a gardener's tasks led to a base which allows the gardener to lean forward and pivot. This was accomplished through the incorporation of an old Pontiac hubcap in an early iteration. The design was enhanced by a contoured seat to help keep the user in contact when leaning. The rear and front of the base was changed to increase its stability. As the profile changed, it evolved into a leaf-like shape, enhancing the product's aesthetic appeal. The design became more refined with each iteration, leading to a prototype tested with consumers for function and market appeal.

The technical development involved various approaches. The early base and seat prototypes were fabricated by preparing plaster molds over which polypropylene was vacuum-formed. For the final base shape, an industrial designer used Alias and SolidWorks to provide a CAD file to a vacuum-former to mold ABS bases with more precision than the hand-made models. Other parts were vacuum-formed for purely aesthetic presentation purposes so it would look more like a finished product. Alias and SolidWorks were also used to develop CAD drawings for obtaining quotes and manufacturing the tooling.

An outside firm obtained quotes from overseas firms to establish the cost of goods. This resulted in design changes to reduce the costs by reducing the number of parts and assembly required. The trade off was the fit of extruded telescopic tubing compared to incorporating the tubes into the

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injection-molded base and the seat. SLA models of the telescoping sections were developed to test this feature. Slight changes were made, and tooling was ordered. The licensee was able to utilize the information we provided them to make more informed decisions. Shipping large parts from overseas adds significantly to the cost, so a decision was made to manufacture them locally.

EVALUATION

Early stage designs were tested by the project team members and close friends or family members who garden. Later, a market research specialist assisted in gathering input from members of garden clubs. They tried our prototype and the competitive products, gave us feedback, the data was collected and analyzed. This led to making the base more stable and gave us information as to their perceptions and the market acceptability of the Garden Rocker.

A structural analysis of the plastic tubes was completed via computer simulations with different materials. Ribs were added to the lower tube section, and the material thickness was increased.

DISCUSSION

After one potential licensee decided against licensing and producing the garden seat, a marketing specialist was hired to look at the feasibility and cost of producing and marketing it ourselves. She subsequently recommended we continue to seek a licensing partner and identified 8 potential partners. We worked out a deal with the second manufacturer we approached.

The licensee made design changes in order to offer it at a low price point. Some features we had incorporated have been dropped for now, but may come with a "Deluxe" version in the future. Once a licensing agreement is signed, you do lose some design control. The manufacturer worked quickly to get it to market and have parts ready for a major industry show. It took them just 5-6 months from the signing of the contract to have first run products in hand. The tool was built overseas to keep costs down, and was shipped during the dock strike, resulting in delivery delays. The advantages of concurrent engineering with the design, manufacturing and marketing members collaborating as early as possible were key to the successful introduction of the product.

REFERENCES

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Figure 1. Photograph of Garden Rocker