

Work package	4
Task	4.6 Blue Print for social remanufacture
Status	Complete
Deadline	Complete
Work package leader	Dr David Bloomfield , Green-Works
Objectives	
Guidance document to provide road map for other to follow and learn from.	
Method	
Summarize lessons learned for this project in context	
Executive Summary	
<p>The project has demonstrated that it is possible to establish a social re-manufacturing venture. Lessons have been learned.</p> <p>This exercise has clearly indicated that New Product Introduction (NPI) into an evolving market is not a trivial undertaking. Launching products into a developing market, as opposed to a stable market, adds to the complexity and risk of the process. To minimize risk it is recommended that a substantial data collection exercise be conducted before formally committing resource to manufacturing.</p> <p>Undoubtedly one of the features of many social enterprises is that staff are enthusiastic and dedicated but often find themselves working in areas in which they have no prior expertise. NPI is difficult enough in mainstream business; when an organization is additionally learning new skills and possibly integrating external expertise and support</p>	

the risks are compounded.

The key requirement for success is that the organization has a very clear strategic vision as to what it is trying to do and this requires a very clear understanding of the marketplace (what products? what customers? what price? what channel? etc). There are unfortunately some common misconceptions (held by many throughout society) that what one can do as a hobby (cook or refurbish furniture etc) can readily be transformed into a business. This is not so.

Design and prototyping are typically small scale development operations to assess generic technical and market feasibility and must not be confused with mainstream manufacturing. Scale up is itself a critical function and one that is not guaranteed to succeed.

Lessons learned can be summarized as:

1. Improve planning, ensure the market is well understood and be realistic in terms of the speed it is possible to penetrate the market
2. Ensure funds are adequate to support the venture (allowing for pessimistic sales growth)
3. Document the whole process including design and design revisions
4. Hire, or have access to, an experienced designer / design team able to interact with both commercial and manufacturing colleagues
5. Hire an experienced and skilled manufacturing manager
6. Use an integrated software package (ERP, MRP)
7. Embed quality into the project based on specifications and customer feedback
8. Ensure a robust link between commercial and production disciplines
9. Don't underestimate the commercial difficulties of selling imperfect goods

General

Establishing a new business is expensive and enterprises considering establishing a remanufacturing venture are recommended to think carefully about the capital required to start up and how they might service any debt. Remanufacturing is not mainstream and in many regards presents a more challenging set of issues than starting a "normal" venture. One fundamental difference is that raw materials are by definition used and it may not be possible to purchase or acquire these to an agreed specification in terms of quantity or

quality. Another critical issue is that the end market; specifically that for “remanufactured goods” will probably be new and constantly evolving, making assessment of the market size and possible trends difficult.

Given that launching any venture is inevitably a risky undertaking it is prudent to carry out the most extensive background research possible before committing serious funds. This is particularly true for organizations that may not be ideally capitalized or have sufficient resource to overcome unforeseen difficulties.

No new venture can succeed without a champion. Recognizing that in the social sector there may not be the funds to ideally resource initiatives, it is even more essential to have a senior champion to nurture the venture. That the Green-Works joinery remanufacturing operation succeeded is in no small measure due to the interest and energy of the directors. Even in the most ideal of circumstances, from time-to-time, things do go wrong and staff morale can flag and this is when the champion is vital.

Design

There is a marketing rule that states “be first to market”. Marketing is the discipline that sets out to understand customer needs and expectations and to position products to meet these; thus Design and Marketing are inextricably linked.

Designers have a challenge: to invent something sufficiently unique that customers might wish to purchase it without necessarily informing potential competitors of the new design. This requires some market research and ultimately market testing. Both can be expensive processes. Even sophisticated market research initiatives can fail because the final proof of viability is not what a prospect might state (in a focus group or in a market survey) but what they will actually buy. Assuming most not for profit organizations are unlikely to have large marketing budgets, market research is likely comprise, to a greater or lesser extent, the (sales) progress of prototype cum development products.

The approach adopted by Green-Works (since some capability and work was already in progress) was iterative and based on attempting to sell various products and to evolve these based on customer feedback. This spawned a vast array of products that were difficult to manage bearing in mind that just for the category of “desk” there was (and still) is potentially 30+ combinations of size, colour, style (with / without cable management “hole”). The product range became too large, compounded by a willingness to design and make specials, particularly when sales were sluggish. Tough decisions were then required to restrict the

product range. A more thorough consideration of design might well have been advisable – taking account of both commercial and manufacturing capability.

Green-works hired an exceptionally creative and able young designer, however there are penalties associated with inexperience. Green-Works did suffer from a number of relatively small misunderstandings and miscommunications derived from the fact that experience was not cross functional. Another option would have been to engage a group of designers from a design house or from an academic institution with the intention of providing both market wisdom and some understanding of manufacturing. There may be an advantage hiring in an external group with their own, or other established, prototyping capability thus delaying decisions on sourcing in-house plant and equipment. Whatever route an organization elects to take, it is clearly 100% essential that the design element has an empathy with the social and environmental ethos of the organization and in this case Green-Works succeeded admirably.

One aspect of design that is fraught with difficulties is “specification and external approval”. At what point in a development cycle should products be submitted for external examination and or certification? Conduct this exercise too soon and the result may be invalidated by subsequent changes to design or by developments in the manufacturing process. Leave it too late and there may be little time (or money) to react to failures. It is worthwhile bearing in mind the following:

- External assessment is typically neither quick or cheap
- Conducting a full range of tests on early development samples may not be financially viable, so considerable judgment is required to select a limited number of critical tests
- The product submitted must be sufficiently close to normal production that the results can reasonably be assumed to reflect later routine production.

A close working relationship with manufacturing is essential. One of our initial prototypes had to be withdrawn because of a mismatch between the equipment capability and the material. There were also issues understanding what could be done technically in terms of prototyping and what was possible in routine production (e.g. understanding material supply constraints limits and machine capability).

The designs that evolved at Green-Works were centered around “wood” or to be more accurate chipboard and in one case MDF. The reason for this focus on “wood” were simply that Green-Works had no metal working capability and the cost of introducing this would have been prohibitive. Further, the production capability was relatively unsophisticated. These two

issues necessarily dictated that certain product designs e.g. desks were, and remain traditional and in the eyes of some, potentially somewhat “clunky” e.g.



When examining the literature of most new desk suppliers one is struck by the fact that there are few designs for such desks. Thus one is limiting ones market to a subset of the total available desk mark.

Additional challenges faced by designers include taking account of:

- manufacturing
- the environment
- disassembly

Surprisingly many designers don't take due account even of the first bullet let alone the second two (which one might argue are manifestations of the same issue).

Design For Manufacture. Our designs generally took account of machine capability; however some designs were over engineered adding to cost. As both manufacturing and client feedback drove design there was occasionally some confusion because of a lack of a properly documented change control procedure. This is vital not only during the “R&D” phase of a product's life but also during post launch manufacturing.

Common issues associated with design for manufacturing include:

- Minimizing the number of production steps
- Minimizing the number of different raw materials
- Optimizing design to minimize generation of scrap
- Reducing the complexity of each operation
- Reducing environmental impact during production (energy etc)

Fundamental to “design” is the strategic question should manufacturing be bespoke or not. The raw materials vary on a daily basis so each product actually required some level of individual “*assessment design*”. However cutting to a specific dimension for a specific client, let alone making a truly new design, requires a considerable administrative effort and indeed space to store unique items. Green-Works is continuing to wrestle with this issue and is evolving into a supplier of standard products but nevertheless takes a pragmatic view to new opportunities.

Design For The Environment. Green-Works products are typically very environmentally friendly and easy to disassemble. This stems from the simplicity of our designs and the very nature of the Green-Works ethos; considerations of the environment are important across all aspects of the enterprise. Depending on the product range and materials chosen for remanufacturing this point may or may not require more critical consideration.

Lessons learned include

- Consider design at the very outset of the project since this impacts literally everything else (manufacturing and commercial)
- Do not attempt to design without some professional design input
- The design function should not only be creative but also have both commercial nous and an understanding of manufacturing.
- Document the design, launch and production process with particular regard to “change control”

Prototyping

In a normal manufacturing environment, prototyping occurs during the R&D phases of a product launch. There is typically a complete infrastructure and process to facilitate product launch and some market research has defined what the product is. This was not the case with Green-Works. Green-Works already had some experience and some low volume batch prototype infrastructure. The market research was largely based on customer feedback from existing initiatives. It would be a major leap of faith for any organization to install significant equipment without substantial market knowledge.

One product (range) was manufactured using MDF and submitted for external assessment. Feedback from the tests highlighted some potential areas for further development. Although by no means insurmountable this information when taken in conjunction with a number of

other factors contributed to termination of the project. It had originally been thought that the supply of MDF (through the normal Green-Works activities) would have provided sufficient feedstock. In practice the absolute quantity of MDF received was lower than expected, the panels sizes more variable and the actual supply erratic. One further substantive problem concerned the need to provide a surface finish i.e. to paint or lacquer the product. Green-Works did not have either the space, expertise or resource to establish a “paint shop” so it was always intended to outsource this activity. Selecting the right finish was not simple; it was an uneasy compromise between a number of competing factors (specification or chemistry, drying time, application requirements, appearance of finish etc). Early prototypes were hand finished but this was a time consuming process that did not produce consistently acceptable results. Attempts to outsource this activity proved troublesome and a not-for-profit supplier was chosen to augment the societal aspects of the project. However the provider’s capability was not sufficiently more advanced than Green-Works and this fact was further compounded by the inevitable difficulties encountered in managing any outsourced manufacturing arrangement. Reluctantly it was decided to terminate this aspect of the project.

There is a difference between what technically can be produced and what can easily and routinely made in a production environment. In hindsight there was not sufficient clarity in making this distinction. Making the wrong decision on a prototype has consequences in terms of both the range of products that can be sold and the operational effectiveness and efficiency with which they can be made.

A large number of prototypes were made in house, from simple shelves to complex book cases, wardrobes, cubes and desks. There was a huge proliferation of designs, prototypes and products and this became unmanageable. Defining specifications and maintaining up-to-date documentation was a challenge and one that it is recommended others devote considerable resource to. It is a hard discipline but developing a systematic approach with go/no go decision points would have been invaluable in constraining the enthusiasm of both the design and sales groups

Green-works already had some manufacturing capability but for others starting afresh the key recommendations are

- Delay establishment of production equipment for as long as possible until there is some certainty as to the final product / product range
- Distinguish between prototype capability and manufacturing capability

It should be noted that to date there has been no consideration of production capability (Cpk) – setting tolerances /specifications in terms of live production data. No one should be under any illusions that unless any manufacturing venture embraces such a quantitative continuous improvement approach they will at best remain a small craft outlet.

Branding / Marketing

Green-Works has in general tried very hard to ensure that any market research carried out was thorough and to avoid the inadvertent pitfall of collecting feedback from a segment dominated by environmental or social motives. It would be very easy to fall into this trap.

As noted above marketing is central to the establishment of a clear strategic direction. Design and marketing are linked and it is marketing that should influence strategic direction e.g. should production be bespoke or standard.

The fact that Green-Works because of the nature of the greater enterprise had a source of “cheap” chipboard for remanufacturing was a happy coincidence. In general, simply because one has a supply of cheap / free widgets does not necessarily mean a market can be found for modified widgets. The Green-Works decision to focus on wood reduced the size of the total available (furniture) market to a much smaller specific market. Marketing considerations were somewhat clouded by virtue of Green-Works already having some visibility in the market place and an interest in manufacturing.

The original Green-Works branding and proposition was, after some years, a little out of date and becoming indistinctive amongst a plethora of green enterprises all setting up with green logos and branding. It was felt that the overall image needed attention and that more attention be focused on remanufacturing.

An outsourced agency was contracted to review the brand and eventually arrived at a stunning distinctive and contemporary new look and feel. One of the features sought in the new brand was to allow for growth of the organization and for business units or product lines to potentially re-brand themselves with the context of the overall image. The entire portfolio of literature, both hard copy and electronic was revised and the web site completely changed.

Significant effort was expended in adding clarity to written messages. This is an invaluable and difficult process, forcing the distillation of “the message” into simple fundamentals, arriving at condensed summaries for a wide variety of applications from display posters to 1

and 2 page leaflets. One extremely useful exercise was to agree a “*what we are and what we do statement*” abbreviated into “the 10 second lift speech”.

The thrust of the web changes were to make the site both more user friendly and easier to manage internally, to improve goggle ratings and raise traffic. One aspect of web marketing that ensures high Google rankings is a constant stream of fresh (relevant) information. This necessarily requires having the resource not only to input the information but also to decide what to add and how to craft this. These are not trivial considerations and in a busy organization the effort required can easily be underestimated.

One aspect of marketing remanufactured furniture to which there is no single simple solution concerns the positioning and descriptions given to product. Some remanufactured goods might be repackaged inside a new or reconditioned box such that the external aesthetics are not obviously impaired. Furniture is almost completely on display and aesthetics are all important and inevitably virtually all the chipboard used had some very minor surface blemish. Two difficulties arise:

- When does the level of blemish become significant?
- How should customers be informed of the imperfections?

It is well known that to sell one should advance as many positives as possible. Highlighting negatives hinders selling. There is thus a fine divide between adopting a brutally honest position and effective selling. Green-Works sells “as seen” and tries to be as ethical as possible but there are and continue to be problems associated with frankly unrealistic customer expectations.

Green-Works is trying to persuade clients that some minor blemish is a measure of their “green” credentials. To facilitate this process and as part of the branding process a logo or mark has been developed that can in future be used to label the furniture. The intention is to try and create something positive from a negative. However further work is required to arrive at more robust quality control procedures and standards before pursuing this tactic.

One aspect of marketing that others might wish to consider is the more formal use of agents and distributors.

Furniture by definition is heavy and even if flat packed is still quite bulky. This concern has limited the geographical scope of sales. For a relatively cheap item, packaging can become a significant proportion of the overall cost and this was not initially understood. Much time and effort was devoted to securing the greenest packaging. Unfortunate as it may be, green

suppliers are often not the cheapest at present. One is then faced with a dilemma to stick to ones principles or to opt for the cost effective solution; again there is no single right answer.

Many joinery customers have been won on the basis of our ability to supply a complete suite of furniture not all of which is remanufactured.

Lessons learned

- Ensure marketing is integral to the venture
- Ensure that the resource is available to follow up and sustain any marketing initiatives, be prepared for a response to branding or other marketing initiatives
- Don't be deceived by simple market research – don't assume that just because a segment of the prospect base reacts positively this is representative of the entire population
- Be flexible and pragmatic in terms of quality issues.

Green-Works arguably has not made enough of the fact that local (UK) manufacture has inherent environmental benefits over most furniture sold in the UK which is wholly or substantially made offshore. Many of the relatively limited number of UK manufacturers almost inevitably source many components (e.g. steel work) off shore.

Scale Up – Production

The project proved that a social enterprise can develop a remanufacturing business unit. However the economics of the enterprise have yet to be validated in the long term. The joinery unit necessarily operated within the context of a larger organization and the apportionment of overheads clearly has a critical impact on viability.

How any other enterprise secures the capital required to establish a similar venture is clearly critical to the overall chances of success. It is not necessarily advantageous to buy the latest equipment but there are some significant downsides to running old equipment.

The project did suffer when the project manager left. Although perhaps this is obvious it does highlight the need to try and establish a stable team at the outset and then to nurture this team throughout the project.

Implicit in the establishment of the project was an assumption that it is possible to set up a manufacturing operation without in-house manufacturing expertise. The fact that Green-Works did ultimately achieve this should not obscure the fact that it is plainly not ideal nor

recommended. Much management time and effort was wasted on identifying and correcting basic issues that a manufacturing professional would have addressed naturally. Hence issues such as cost reduction, waste reduction, quality improvement etc were perhaps not addressed as vigorously as they might have been. The lack of best practice knowledge can have potentially serious consequences. There are layers of regulation concerning “manufacturing” that most people are ignorant of and ignorance of the law is not a defence in law. For example, one must have a material safety data sheet for the materials used in production however commonplace they are. Simple glues, solvents, lubricants and degreasers that are found and used in most homes in the country, when used in an industrial setting require an assessment of risk, hence the need for the safety data sheet. The materials must be stored properly, and the appropriate protective equipment identified and used. All of this must be documented. Health and safety in general is an area that can easily be forgotten.

Remanufacturing by definition is not a normal business in the sense that raw materials can be sourced from a stable supply base at predictable times with known costs and an agreed quality specification. This has a number of ramifications:

- Quality
- Scheduling
- Operations
- Commercial

This author has observed in more than one social enterprise, that concepts of quality and quality control are not well developed. In a remanufacturing concern this can and did in this case lead to problems such as defective goods (in the view of the customer) being dispatched. It is recommended that an understanding of “quality” is embedded into any operation from the outset such that appropriate training and controls can be developed. Incoming QC may well figure more prominently than in a normal production environment. In-process controls as well as end of line inspection took time to develop and as noted elsewhere there are inherent issues concerning acceptable quality levels.

Scheduling is a serious concern when raw material supply is not guaranteed. Simply quoting extremely long lead times is not commercially viable. Scheduling also suffers from vagaries in machine performance (see below). The only solution is for extremely efficient communications systems. Ideally an integrated software package (MRP or ERP) that links customers to production capacity would have been useful. These packages link all the steps of production and assist with scheduling and buying, providing the opportunity to manage a

seamless system and thereby reducing the opportunities for human error. Green-Works did not and does not have such software and was forced to develop and integrate ad hoc manual and electronic systems. Operational staff need to be in constant communication with commercial colleagues to try and understand potential incoming raw material (chipboard) supply and match this to production needs. This is again a requirement that is over and above a normal operation. Ultimately variability of supply increases costs.

Superficially a desk is a desk. However it is not always possible to display the exact desk a client might wish to buy because the raw materials might not be available when the order is negotiated and the type size and number of surface blemishes varies from piece to piece. This can and does create problems.

In manufacturing, planning is everything. There is a well established suite of advanced quality planning tools (e.g. Failure Mode Effect Analysis FMEA) that can be deployed to predict and eliminate or at least minimize potential problems. These were not used at Green-Works. However various industry experts did offer pro bono advice. The trouble with this is that one often does not understand why particular advice is given and thus what problems are being addressed. The operation then runs without developing its core manufacturing competency.

In the current cost down climate of waste minimization it is vital for the longevity of the enterprise that steps are taken to inculcate such a systematic approach. We have not yet risen to this challenge in a continuous quantitative manner. But at least we are aware of the need.

Purchasing was not given the priority it should have been. In a typical social enterprise environment cash is tight and much capital can be tied up in slow or non moving stock. Equally, buying only the minimum quantity of goods increases the unit price, adds to administration costs and potentially can lead to production shortages. In small organizations there is typically not enough resource to have a dedicated buyer. A good manufacturing manager should be able to assist in this regard.

Commercial initiatives must take account of production quality issues and be sufficiently flexible to cope with supply disruption. There is a definite relation between price and quality but it should not be assumed that many prospects will compromise quality below a certain minimum level. There is a continuing issue in that incoming material even if its type (e.g. 1800 beech desks) is known in advance (and this is not guaranteed) may arrive so badly damaged that it can not be used, potentially compromising possible sales.

Plant layout and equipment specification are vital to address at the planning stage. What works in the prototyping stage is often not ideal for production. Funding will usually dictate that the equipment is not new. Much of our equipment was reconditioned and or tended to be a basic model. Using old equipment creates the following problems

- Increased risk of breakages
- Higher maintenance requirement (and this may not be realized by staff)
- Lack of spare parts
- Dearth of service engineer availability

Green-Works operates from an old warehouse with no control of temperature, light or humidity. Staff did not appreciate how these could impact our processes. There were for example problems with edges not being glued firmly in place. When production problems such as this occur having the capability to adopt a proper investigation is vital. The most likely causes for the edging problem were a combination of poor machine maintenance and set up and an inability to understand that glue properties may change with ambient conditions.

Summary

This project has demonstrated it is possible to establish a social remanufacturing venture. It must be borne in mind that Green-Works was already a large and established concern before the remanufacturing project was started and this in no small measure contributed to the success of the project.