

Decision Making Process for Implementing DFMA at IGT

ABSTRACT:

This paper is about the approach and decision making process that an engineering group can adopt to implement DFMA in their work environment. Implementing the DFMA methodology and techniques in an engineering department can be perceived at first as a simple and non challenging task especially when the expectation is that you are dealing with an open minded, innovative group. Yet the implementation proved to be a multi faceted challenge. Through the course of this implementation a number of unknown variables became obvious and highlighted the need to establish a process that can be characterized as both focused and flexible.

International Gaming Technology

International Gaming Technology (IGT) is a global Fortune 500 company of nearly 5,400 employees worldwide working within a highly regulated industry. There are approximately 2,500 employees working in the design, manufacture and marketing of electromechanical gaming equipment. The Manufacturing facility is over 1 million square feet, and is based in Reno, Nevada, where IGT is one of a few large employers, and thus, is recognized as being of importance to the local community. The Mechanical Group, a part of the Hardware Engineering Department, comprises 50 engineers and designers, and is responsible for the design and development (packaging) of electromechanical configurable hardware. Many of the engineers and designers working within the Hardware Engineering Department and other departments have significant number of years working at IGT, and in many cases, have been employed since graduating. This has promoted a deeply entrenched culture which ultimately impacted the DFMA implementation.

Background

IGT is recognized as one of the worlds' leading organizations in gaming machine and systems manufacturing. Their very successful business model has always focused primarily on the design and development of new games, and would utilize all resources to ensure a continual flow of games and innovation to meet the constant demand from buyers, as new markets opened. For the Hardware Engineering department, priority was placed on time and quality (perhaps more than cost) and was reflected in a

significant budget that enabled projects to meet aggressive deadlines. This was the case until recently, when the economic crisis impacted on our customers, and the gaming industry worldwide. These events have challenged our engineers to seek new opportunities for cost-reductions, alongside innovative design and development.

Having played the lead role in implementing DFMA in two previous companies, I recognized the significant benefits and opportunities DFMA would bring to IGT. The benefits, I foresaw, included cost-reductions and better designs for manufacturability as well as provide a learning opportunity for our engineers and contribute to their career growth.

About 4 years ago, I raised the issue of cost-reduction, and implementing a DFMA program. My efforts were met with confidence that this was not necessary within IGT, as they were successful, and that the prevailing processes incorporated any potential cost-reduction. Typical responses included: “Why?”, “We have no time for this”, “We don’t need it” and “We have always been doing it this way”. However, as stated, I believed in DFMA, and persisted in my efforts to promote and introduce DFMA to IGT.

Observations

My initial observations identified that the engineers’ perception of DFMA was that it is a time consuming practice, unknown benefits and the size of the company would make it challenging to implement. There were also a number of engineers who believed that they had been, or were, working with DFMA principles and therefore had nothing to gain by formally introducing DFMA to IGT. Added to this, were the various management levels, and number of approvals required to get any new methodology or software implemented.

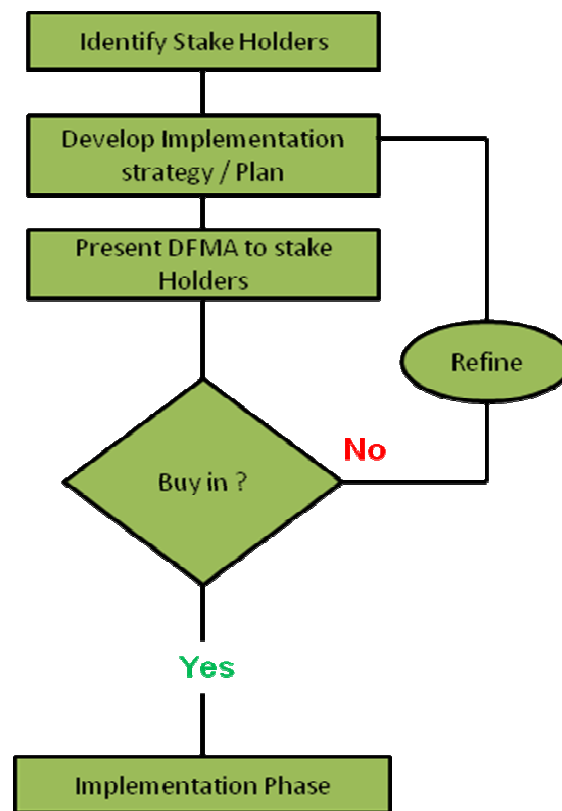
To effectively implement DFMA in IGT, I identified that the organizational layers had to be addressed one at a time, and/or in parallel with other activities. My primary concern was the level of resistance to DFMA. The reasons I identified for this resistance included:

- fear of change to an new methodology that may compromise project deliverables,
- reluctance to involve external consultants to lead the implementation,
- the cost of training engineers, and
- the cost of acquiring software. In addition, the software was also perceived as being a tool that converts assembly and that the data within the software had to be maintained regularly.

PHASE 1: Implementation Planning

My first challenge was to develop an implementation plan, following IGT procedures. At this stage, I received approval to commence the DFMA Program.

My initial approach was to encourage department buy-in and win long term commitment for DFMA, by providing a better, and true, understanding of DFMA concepts and benefits. In the first instance, I identified stake holders within the department, then, set up a presentation for them, with a DFMA BD consultant.



This approach failed in its purpose to win support due to a lack of emphasis on DFMA as a *methodology*. Given the culture at IGT for resistance to software and consultants, and the presentation that focused primarily on the software, it was not surprising that the stakeholders solidified their objections to DFMA.

The Strategy was reevaluated, and the implementation plan was refined, taking into account that both management and engineers had their own concerns that needed to be addressed. These included:

Management Concerns

- a better understanding of DFMA concept and benefits;
- measuring the (risk) of implementing DFMA on high profile projects;
- the impact of DFMA on existing department processes.

Engineers Concerns

- Fear of impact on project time (and impacting their individual performance)
- 'interference' with their designs (a number of designers were protective of their existing designs, and insisting that they could not be improved)
- Level of ongoing management commitment to DFMA?

Multi-faceted & multi layered approach to win support for DFMA

The resulting strategy was to introduce a formalized program (pilot workshop) that would educate and raise awareness of DFMA values and benefits throughout different departments to enable an “alignment in shared vision” throughout the company. This would be achieved by:

- **Involving other groups including manufacturing and electrical engineering.** By bringing together people from these groups, I intended that this would create better communication between them, and enable the engineers to understand the impact of their design decisions on manufacturing and assembly of their designs.
- **Showcasing successful implementations** such as Harley Davidson. Harley Davidson (HD) was selected to promote DFMA as they had a similar implementation path. HD also peaked the interest of IGT engineers;
- **Identifying champions and influencers.** Potential champions included decision-makers and management staff, who would be part of the approval process, as well as benefit from the DFMA implementation. Influencers included those charismatic and open-minded engineers and designers who could embrace DFMA and have the skill sets to advance their designs.
- **Highlighting potential candidate assemblies that would benefit from a cost reduction exercise using DFMA.** The criteria selection was based on

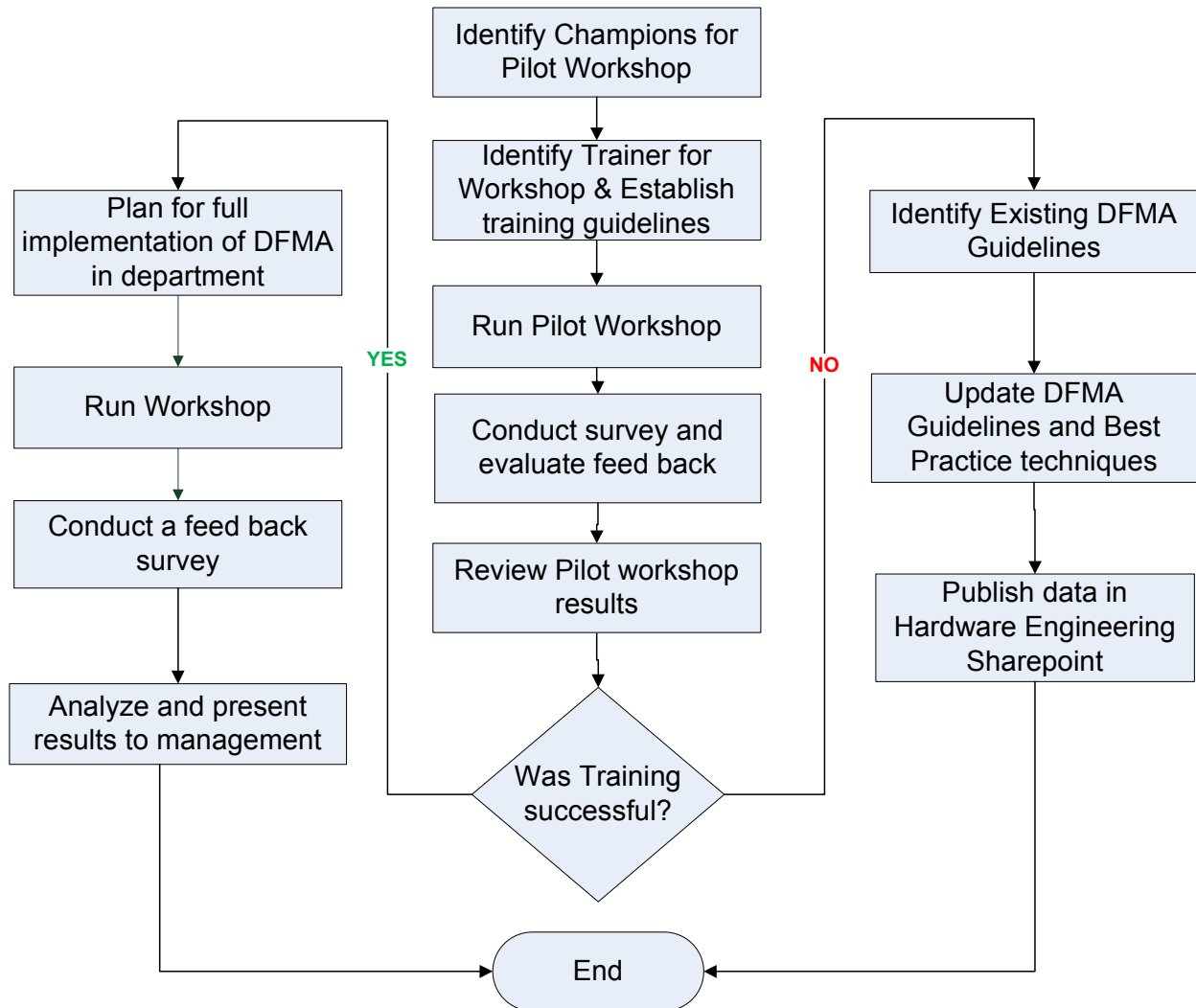
assemblies from current/new products with high part count and usage in order to run a DFMA analysis, and which were expected to demonstrate significant positive outcomes.

- **Promoting DFMA principals** By encouraging open discussions on new ways of approaching problems, and to change the 'status quo'.
- **Identifying a clear and well defined 'gate' or benchmark** that would provide a firm answer on whether the DFMA methodology and process should be implemented throughout the department.

PHASE II

Acquiring approval for pilot workshop

A revised plan was presented to management requesting minimal investment for a pilot workshop to a select number of participants from the manufacturing, electrical and mechanical groups. The outcome of which would identify the true value (or not) of implementing DFMA. The decision was made at this time, to proceed with a Pilot Workshop. It should be noted, that the company was dealing with the challenges of the global economic environment, and cost-reductions were now a priority placed on all departments throughout the organization. This played a major part in getting approval for the Pilot Workshop. However, even though the Workshop was approved, management did not have any high expectations that the DFMA program would continue. It was decided that if the Pilot Workshop was deemed unsuccessful, the results would be collated, and put onto hardware engineering share point (intranet) for future reference.



Strategy of Pilot workshop

The management goal of the pilot workshop was to determine the value of implementing DFMA for IGT; however a key factor in achieving this goal was to ensure that the participants were *empowered* by DFMA and would *demand* its continuing implementation throughout their department. So, the success of the Pilot Workshop was dependent on the strategies to control and encourage a positive outcome. These were:

- Participants would bring assemblies they designed to the workshop – assemblies would be pre-selected to ensure that they satisfied the criteria for current/new products with high part count and usage. The results from this exercise would provide a metric to measure the immediate and significant impact on cost and

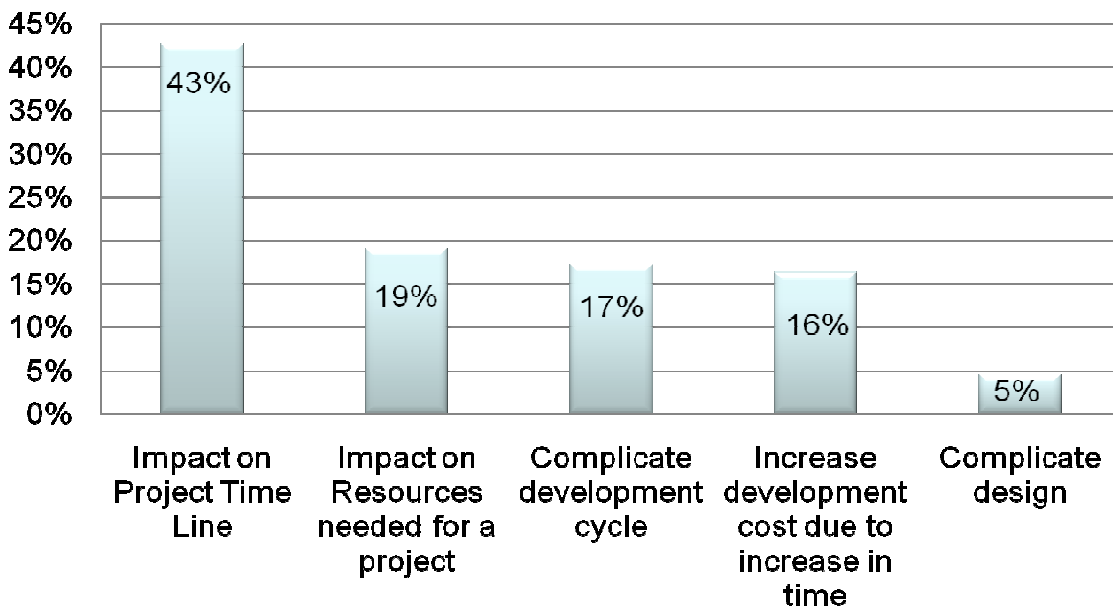
parts of assemblies. In addition, it was thought that the participants would be more 'engaged' in working on a 'real project' with immediate results.

- Participants were selected based on specific criteria. The criteria included an open mind to new methodologies, and persons who could influence others in accepting the new methodology.
- Balance of experienced and new engineers and designers. A mix of primarily graduates (young engineers) who could bring their enthusiasm as well as experienced technical lead engineers who could influence others to promote DFMA throughout the organization.
- Advise participants on DFMA software availability. It was important that the participants knew that software was available, but not approved for purchase, unless it was requested (after the workshop).
- Identifying metrics and presenting (positive) results to management. It was important to involve management in the workshop, and they were requested to attend the final part of the workshop. During this time, the participants would present the outcome of the workshop assemblies, listing the (positive) outcomes of the workshop – namely a reduction in costs and parts.
- Selecting a consultant who would conduct the workshop with clear and well defined expectations, in particular focusing on the DFMA *methodology* and *principles*. A consultant was sought through BD, and worked closely with me, in ensuring that the outcomes were directed towards my objectives.

Pre-Workshop Questionnaire

When the selected participants for the pilot workshop were invited to attend, some reluctance was noted. This was reflected in a pre-workshop questionnaire. Listed below is the response to one of the questions highlighting the level of concerns the participants had on the impact of time, resources and complicating their designs *before* the Workshop.

What do you think are the risks of implementing DFMA into IGT?



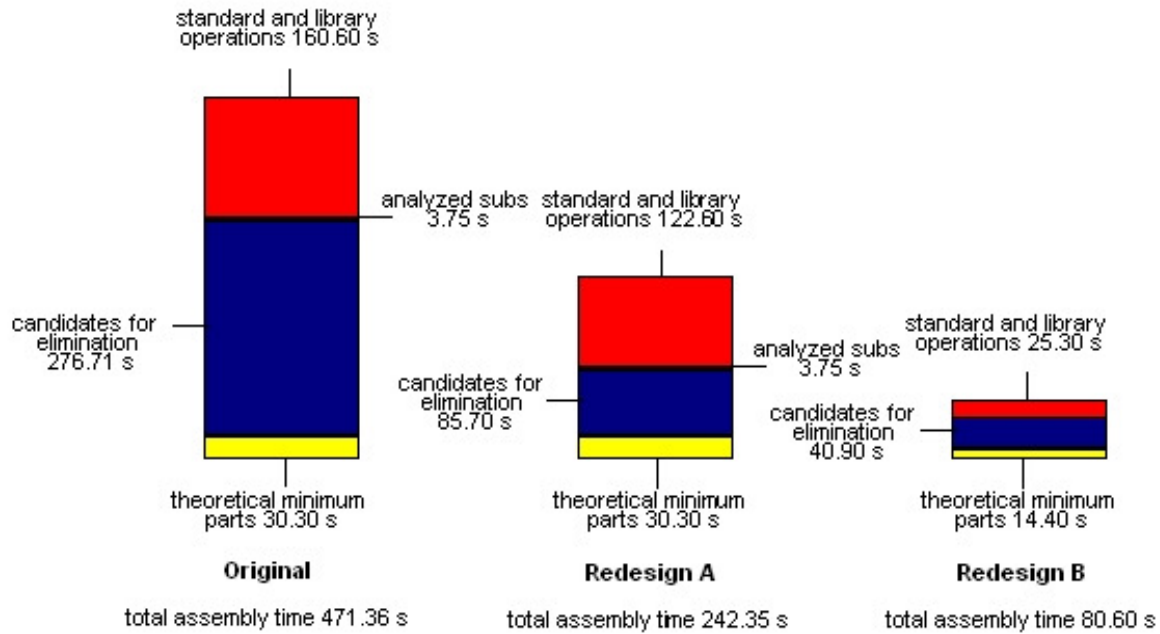
To counter this negative perception, I decided to initiate a number of pre workshop meetings to empower and motivate the team and reinforce the goal and intent of the workshop, as well as selecting and preparing assemblies. The team became the champions of DFMA within the department.

The Directors of Manufacturing and Hardware Engineering were invited to 'open' the Pilot Workshop to demonstrate management commitment to DFMA. As the Workshop progressed, the participants' enthusiasm grew significantly as they applied DFMA techniques in their existing designs, and ultimately welcomed the challenge to improve their designs. Pushing design boundaries beyond the status quo and with open communication between the various disciplines (manufacturing, mechanical and electrical) resulted in innovative approaches to solving design challenges. The success of the workshop was demonstrated when the management team attended the participant presentations at the end of the workshop, and were surprised at the enthusiasm with which the participants had embraced DFMA.

Utilizing the above strategies ensured that the outcome of the workshop was notably successful with immediate, measurable value to IGT, both in terms of reduced cost and parts. Below is a summary for an assembly that was analyzed and redeveloped at the workshop.

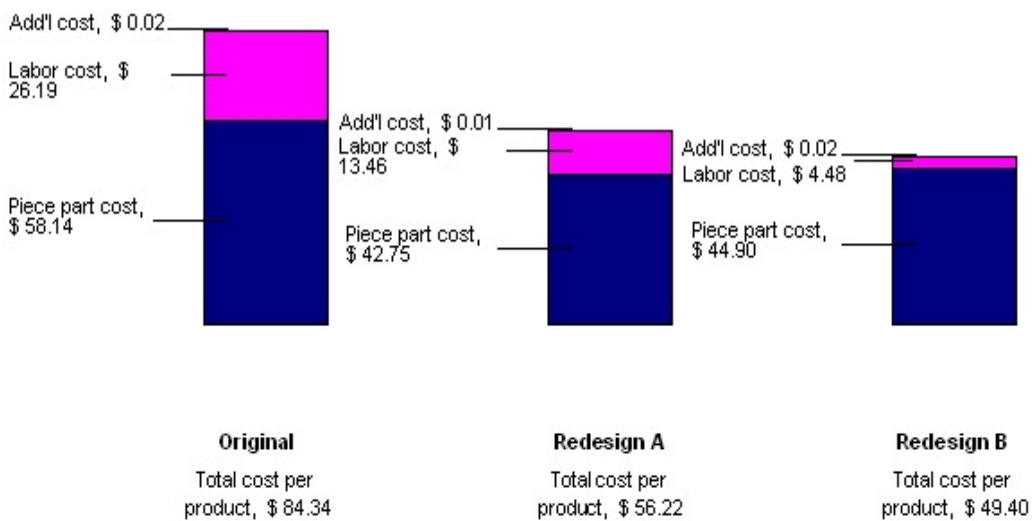
Executive Summary Comparison – DFA

The chart shows a breakdown of time per product



Executive Summary Comparison – DFMA

The chart shows a breakdown of cost per product

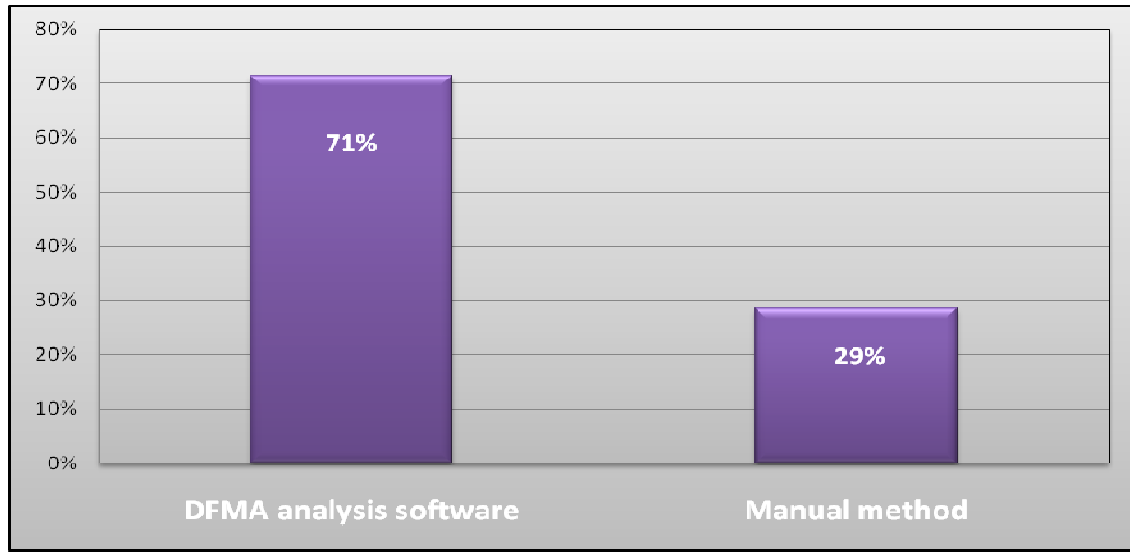


Survey

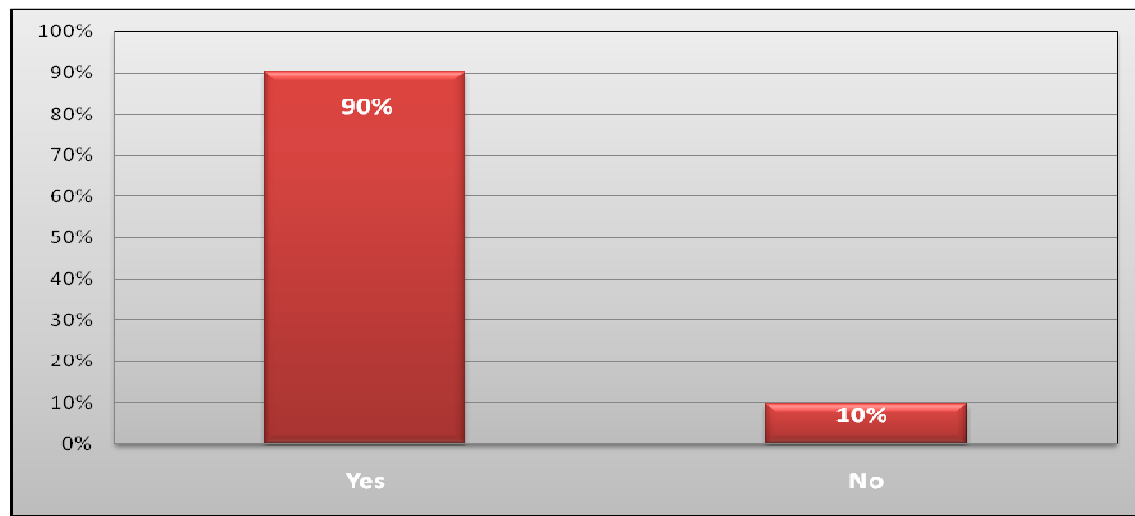
The Questionnaire, and conducting a survey *after* the Pilot Workshop, proved exceptionally helpful, in presenting the findings to the decision-makers in management, and to get approval to continue the implementation throughout the department.

Questions in the survey included:

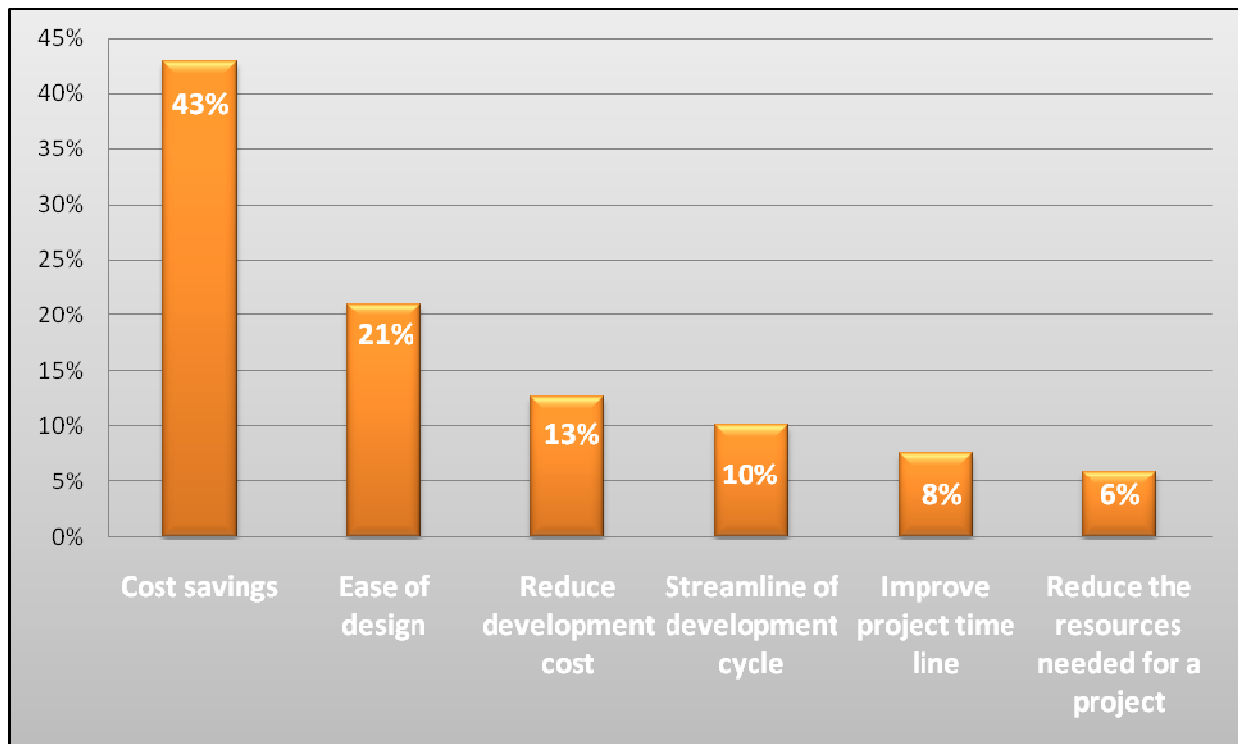
If you are asked to run DFMA analysis on your assembly, would you use the DFMA analysis software or manual method?



Do you believe DFMA should be implemented in our department?



What do you think are the benefits in implementing DFMA?



SUMMARY

The active participation of BD and the consultant during this decision process was instrumental in the success of implementing DFMA. The pilot workshop champions passed on their experiences, and in response, the rest of the engineers and designers demanded training and software. Management approved an ongoing DFMA program, and training was concluded in June 08. As a result, cost savings in excess of \$1M have been achieved to date, and more savings are expected. The engineers have fully embraced the concepts of 'thinking and acting' DFMA, and continue to practice what they have learned.