



Walt Disney World Swan and Dolphin Resort
Orlando, Florida

Mechanical Solutions for Smaller Companies

Kevin Smedley - Engineering Design Systems, Inc.

MA42-1 This class will discuss manufacturing solutions for small manufacturing companies. We'll see how smaller companies can create, manage and share digital assets throughout the manufacturing process. Learn how to streamline designs using Autodesk Inventor and quickly share that information with the shop floor and outside vendors with DWF. A full solutions scenario will be shown to explain the workflow from design to approval to manufacturing. Finally, we'll look at how to budget the implementation and security of data year after year.

About the Speaker:

Kevin has been a mechanical applications engineer for over 9 years. EDSI has been structuring solution sales and implementations since Mechanical Desktop v1.0. Previously, he was a CAD manager for an AEC firm in Winston-Salem, NC, where he headed up the company's CAD committee. Prior to that position, he headed up the creation and implementation of a CAD department at a Concrete Company in Greensboro, NC. In 1993 Kevin founded and served as president of the Winston-Salem AutoCAD Users Group (WSAUG). Kevin has been using AutoCAD since version 2.52.

kevin.smedley@edsi.com

Introduction

My name is Kevin Smedley and I am a Sr. Mechanical Applications Engineer for Engineering Design Systems, Inc. out of Roanoke, Va. My credentials include Inventor 10 Expert Certification along with MICE (Mechanical Implementation Certified Expert) Level II Expert Certification. I have been the Mechanical Applications Engineer at EDSI for ten years.

Prior to this position, I was the Engineering Cad Manager for a firm in Winston-Salem, NC. While at that position, I chaired their Cad Committee and founded the Winston-Salem Autocad Users Group (WASUG).

In 1991 I started a Cad department for a small Concrete manufacturer in Greensboro, NC. There I implemented 2 stations of Autocad R12, purchasing and justifying the Business Investment.

My main job functions are to assist EDSI Mechanical customers at being successful, whether it is 2D or 3D. Over the past ten years I have seen companies be very successful and also fail at driving Mechanical Investments to success.

Kevin J. Smedley
Sr. Mechanical Applications Engineer
Engineering Design Systems, Inc. (EDSI)
3780 Peters Creek Rd. Extension, SW
Roanoke, VA 24018
540-345-1410 voice
kevin.smedley@edsi.com



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Mechanical Solutions for Smaller Companies

Strategies of a Small Company

When small companies begin pursuing the technological road, they must look at the same questions that large corporations are continuously asking themselves. This does not say they must answer the questions the same, but the overall strategies must be looked at and decisions made in accordance to their business direction.

The main approach focuses on five (5) strategic decision making levels with a future sixth where applicable. We shall discuss all five strategic levels and hit on the sixth. The following is an outline for discussions:

Business Strategy

- Strategic Plan
- Initial Purchases
- Implementation
- Year to Year Technological Upgrades

Design/Drawing Strategy

- Autodesk Inventor
- Autocad Mechanical
- Autocad

Data Management Products

- Vault 4
- ProductStream 4

Viewing Strategy

- Dwf Viewing Strategy
- Inventor Viewer
- Autocad Viewer

Translation Strategy (CNC)

- STEP
- SAT
- IGES

Six Sigma

- for the Little Guy

Link: [Engineering Management - Six Sigma for the Little Guy](#)

Strategic Planning

A strategic plan can provide the foundation and frame work for a business plan. A strategic plan should be visionary, conceptual and directional in contrast and is likely to be shorter term, focused, can implement and be measurable. A satisfactory strategic plan must be realistic and attainable to allow managers and small businesses to think strategically and act operationally. Small companies need to be able to Create, Manage and Share as efficiently as larger corporations in order to maintain absolute profit. A strategic plan focuses not only on the quick fix, but on the long road it takes to drive efficiency.

A very well conceived strategic plan incorporates all factors that will span an 18 – 24 month period. These factors should incorporate design creation, drawing accuracy, analytical power, data management and viewing capabilities to share engineering data with other firms.

A Business Strategy can be very complex in an overall form. We shall look at the engineering business strategies directing ourselves to a complete engineering solution incorporating Cad 2d/3d, document management, viewing and translation processes. The mantra Create, Manage and Share clearly defines a strategic path allowing a companies management to make clear and concise decisions based on technologies in the marketplace.

Small manufacturers are the undisputed backbone of the U.S. manufacturing market. Their influences are strong from generating small piece parts for the automotive industry to designing packaging machines for pharmaceutical companies. Still small manufacturers are less likely to know about and implement different manufacturing methods, new technologies and current business practices, as opposed to large firms.

Strategic planning and the execution of the business strategy through people, processes and technology, is a powerful competitive weapon that not enough executives use to their advantage. Only about 30% of small manufacturers have a clear and compelling vision with coordinated strategies and action plans. At least half of those companies who have a strategic plan are able to successfully execute their strategies and achieve their goals. A quote from Robert Heller: "Imperfect strategy that is implemented is much more valuable than perfect strategy that is never implemented".

Purchasing power is a key element to the whole business plan. Small Companies see this as the biggest deterrent to going forward.

References:

Robert Heller, Thinkmanagement.com

*** <http://www.thinkingmanagers.com/management/business-strategy-success.php>

The Business of MEMS:

*** <http://www.knowledgefoundation.com/events/11061542.htm>

Society of Manufacturing Engineering

*** <http://www.sme.org/cgi-bin/get-mag.pl?&&01ocm044&000007&2001/01ocm044&ARTME&SME&>

Initial Implementation Strategy

What is an Implementation Plan?

The carrying out or physical realization of something! The phrase "there are various implementations of the protocol" means that there are several software products that execute that protocol. A computer system implementation would be the installation of new hardware and system software.

Implementation

In **engineering** and **computer science**, an implementation is the practical application of a method or **algorithm** to fulfill a desired purpose. For example, one might create a **computer program** that sorts a list of numbers in ascending order. To do so, one would implement a known **method of sorting**.

So, how do you strategize your engineering applications (i.e. Cad 2d/3d, viewing, printing/plotting, ect.)? First, look at the current engineering applications and determine if they meet today's technology. Second, research other companies and what level of technologies and procedures they have incorporated *into that specific business*.

2D/3D Implementation Plans:

Whether you are strategizing for 2D or 3D, a comprehensive implementation plan is essential. A Cad implementation begins with how licenses are distributed throughout the engineering department (Network/Standalone or Mixed). Software installation is fairly basic, but the Cad application configurations are paramount to standardizing direction. Cad Standardization allows users in an engineering department to stay on the same page and fully understand the tools and techniques.

Further questions that will determine exact direction is whether or not the small company chooses a 2d or 3d application. When making the decision between 2d & 3d there are many questions to ask and research.

2d Applications

- Is a 2d application capable of upgrading the small company's design and fabrication documents?
- Will 2d drawings correspond the proper design intent to the small companies cliental?
- Will 2d applications lend itself well to the employee structure related to the small company's business strategies.

3d Applications

- Will the technology of 3d enhance their business strategies for design and fabrication documents?
- Can 2d documents be produced from 3d models efficiently?
- Is there an employee base available that will stay within the small company's business structure?
- What other tangibles will 3d technology bring the business over the coming 18-24 months?

Comprehensive thought must be detailed when strategizing an implementation plan. Strategic training plans for new technologies need to be incorporated into the plan. We must remember that an implementation plan (as stated in the business plan) can and is usually phased in over a determined amount of time.

Document Management Implementation Plans:

How are documents stored and shared now, and can a program increase the security of replication? Most, if not all, small companies store their documents either on a couple of stand alone systems or a basic server system. Stream lined methodology for document management can increase the viability of cross referenced documents.

Viewing/Plotting/Printing Implementation Plans:

How will a small company share its information? Is a plotter/printer already at the office or does that need to be added to the business plan? Implementing interior sharing compared to exterior sharing bring a lot to the forefront.

- How to distribute final shop drawings to the plant (full size plots or small prints)?
- Does the small company implement computer systems on the shop floor and distribute final documents by viewing?
- Will the small company share design data outside of its own walls?

CNC Implementation Plans:




Whether it is this specific small company or another vendor/machine shop, how will the parts be milled and/or lathed? There are many factors when looking at the far reaches of a business plan.

1. Will CNC machining be within the business strategy?
2. Does this small company have machines that can read translated DXF/IGES/STEP files for writing code?

Solutions

Solve

solve  P Pronunciation Key (sɔlv, sɒlv)
v. solved, solv-ing, solves
v. tr.

1. To find a solution to.
2. To work out a correct solution to (a problem).

Source: The American Heritage® Dictionary of the English Language, Fourth Edition
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solve

v 1: find the solution to (a problem or question) or understand the meaning of; "did you solve the problem?"; "Work out your problems with the boss"; "this unpleasant situation isn't going to work itself out"; "did you get it?"; "Did you get my meaning?"; "He could not work the math problem" [syn: work out, figure out, puzzle out, lick, work] 2: find the solution; "solve an equation"; "solve for x" [syn: resolve] 3: settle, as of a debt; "clear a debt"; "solve an old debt" [syn: clear]

Source: WordNet ® 2.0, © 2003 Princeton University


A wise salesman once said "There must be a problem to need a solution"!!! Do these small companies looking to the future have problems that need specific solutions for their company?

Solutions must be researched and analyzed from a number of sources relative to that small company. All relative solutions must be incorporated by all levels within a small company starting at the top. The owner, president, CFO, middle management, I.T. director down to the engineering teams must believe in and strive for the future. A solution is not fixed in the 18-24 month time frame first strategize, but in the coming 5-10 years.

The solutions extracted from the research are at times tough and exhausting, yet in order to reach company business goals there must be change. Technology is always creeping up and expanding beyond some small companies. Within the business plan there are financial plans that usually guide a large part of the strategy. Small companies hardest hit in a good business plan is the initial investment. An ROI (return on investment) plan can assist when looking at how the new strategy will show financial gain. Research and analysis from the Business and Technology Plan can yield a cognizant ROI.

Create | Manage | Share

Create:

cre·ate  P Pronunciation Key (krē-āt)
tr.v. cre·at·ed, cre·at·ing, cre·ates


- To cause to exist; bring into being. See Synonyms at found¹.
- To give rise to; produce: That remark created a stir.
- To invest with an office or title; appoint.
- To produce through artistic or imaginative effort: create a drawing, poem;

Why CAD? Comparing human pencil drawings to technical computer drawings almost matches up, but when any type of change needs to be enacted the computer drawing is 10 fold quicker.

2d drafting on a computer has only been in existence for a short time compared to centuries of hand drafting and model sculpting. For the past 20+ years Autocad has been the main 2d solution for small companies.

With today's technology, engineers can model parts, shape an assembly and easily create 2d drawings. Autodesk Inventor is a 3d application that boasts the most technology with magnified ease of use. Whether creating engineering documents with Autocad Mechanical (2d) or Autodesk Inventor (3d) these applications are the forefronts of the technology heading the rest of the solutions that must follow.

Manage:

man·age  P Pronunciation Key (mān'īj)
v. man·aged, man·ag·ing, man·ag·es
v. tr.

- *To direct or control the use of; handle:* manage a complex machine tool.
- *To exert control over: "Managing the news... is the oldest game in town" (James Reston). "A major crisis to be managed loomed on the horizon" (Time). To make submissive to one's authority, discipline, or persuasion.*
- *To direct the affairs or interests of:* manage a company; an agency that manages performers. *See Synonyms at conduct.*
- *To succeed in accomplishing or achieving, especially with difficulty; contrive or arrange:* managed to get a promotion.

Managing electronic engineering documents can either be a manual endeavor or a processed methodology. Document management can take on many different aspects depending on whether it is a 2d or 3d environment.


If the plan is 2d across the board, Cad data is much easier to handle for the simple reason that there are not as many files to maintain. Yet, if the technical capabilities of the Autocad user(s) encapsulate Xreferences the 2d associatively must be maintained.

If the plan is 3d, there must be a more stringent management structure. With multiple database files from Autodesk Inventor, a Document Management plan could be critical. Autodesk Vault allows work in progress versioning and security. In 2d an Autocad drawing of an assembly may have one dwg file, while Autodesk Inventor may have dozens.

Autodesk ProductStream advances the Vault capabilities and adds the abilities of revisions and ECO's (engineering change orders). Autodesk ProductStream allows project management outside of the Cad environment that allows check and approval management.

There are further advantages in using the Autodesk Vault, such as publishing viewable DWF files. This is another tool within the total implementation plan with large benefits to a small company.

Share

share¹  P Pronunciation Key (shâr)
n.

- *A part or portion belonging to, distributed to, contributed by, or owed by a person or group.*
- *An equitable portion: do one's share of the work.*
- *Any of the equal parts into which the capital stock of a corporation or company is divided.*

Sharing electronic Engineering documents is critical to the collaboration of a project. Sharing can take shape in a number of ways. This could be a critical link to clients, vendors, additional machine shops and most important team collaboration within that small company. Following are a few different methods to implement.

Printing/Plotting

- Mainly used for final drawing output which manufacturing will use on the shop floor.

DWF viewer (drawing Web Format)

- A light transferable drawing file (2d or 3d).

DWG viewer

- A program that allows the viewing of Autocad files without translation.

Inventor viewer

- A program that allows the viewing of Autodesk Inventor files without translation.

These four viewing strategies can be mixed and used in many forms. The methods implemented are based on the receiver of the files.

In addition to viewing strategies there may be the need to translate files for CNC machining or even the sharing of data to other with different Cad systems. Collaboration and communication can be paramount for a large number of small companies.





Small Company's

In southwest Virginia there are a tremendous amount of small companies. There are a few large corporations and we are working closely with them, but small company's are usually in more need of direction than large corporations. Most Small Company's have slowly come along with Cad Technology and often are using an older version of Autocad. With the use of an old version of Autocad and a young user making his own way with the product, upper management has been content with the drafting computer. The user base works there hardest sometimes knowing there are better tools available.

Let's talk of two companies' that are vastly different, yet are looking for the same solutions.

 ESS Technologies, Inc.

A small and up coming Engineering and Manufacturing Company that designs turnkey packaging systems and are based in Blacksburg, Va.

			
AS70	AS120	ASV50	C97

During the winter of 2003 ESS Technologies came to Engineering Design Systems, Inc. researching Autocad/Desk technological solutions. Kevin Browne, Owner/President), already had a business plan applied to his small company and now was looking for a technological implementation plan. ESS Technologies had been using Autocad R14 and 2000 to create designs and drawings. Kevin Browne through his business strategy fully understood that in order to maintain and grow his business strategy, he must incorporate the leading edge of today's Cad technology. ESS Technologies business plan also had a strategic financial plan.

Engineering Design Systems, Inc. and ESS Technologies initially sat down in a meeting and laid out all the Cad technology available from an Autodesk perspective. The conversations began with ESS Technologies current capabilities using Autocad 2000.

- Does basic Autocad 2000 (2d) create the Cad documents sufficiently enough relating to accuracy and speed?
- How are the DWG files managed?
- How are the DWG files shared?

The general answer to these questions was "old school"! They have two Autocad users who have been capable of producing very good 2d documents, but there are not any custom programs and/or procedures in place. The DWG files are managed manually using basic Windows explorer distributed over two standalone systems. And finally, they share by either printing/plotting, distributing/receiving DWG, DXF drawings files.

A Proposed Total Solution:

- Autodesk Inventor 10
 - o Power of design and functionality
 - o Quick production of piece parts
 - o Engineering analysis and creation of typical components
 - Design accelerator
 - SQL based Content Library
 - o Kinetic motion design
- Autocad Mechanical
 - o To maintain existing Autocad data
- Autocad Electrical 2006
- Autodesk Vault 4
 - o Version control of parts and assemblies
 - o Security of files within a multi-use environment
- DWF Viewing
 - o For design approval and purchasing
 - o Released drawings for printing/viewing
- STEP Translation
 - o For use with outside vendors using other 3d/2d applications

These proposed solutions were strategically designed into phases that spanned 12-18 months. The implementation strategy was in sequence with ESS Technologies business plans and based on their financial time tables. The projected ROI (return on Investment) was a modest 20% based on a 12 month time table.

In April of 2004. ESS Technologies made the decision to follow the solutions recommended by Engineering Design Systems, Inc. The implementation scenario was laid out as follows:

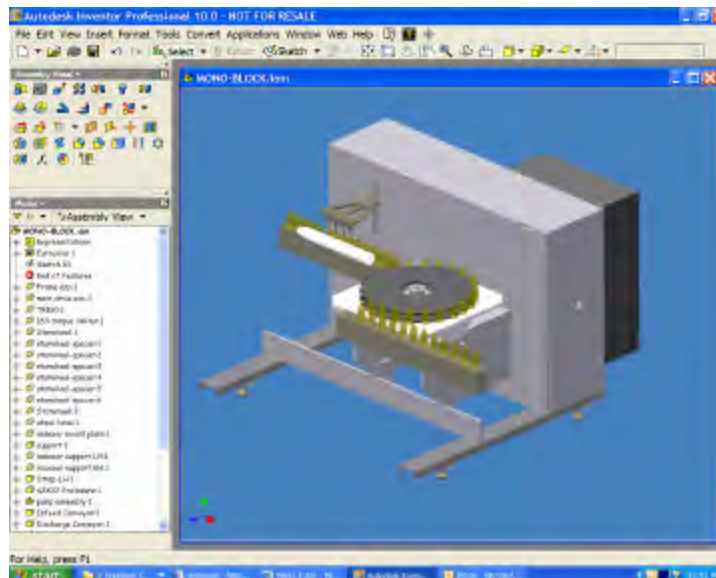
Phase I

- EDSI installed a 2 node network license of Autodesk Inventor Series (AIS) and distributed it over 3 stations.
 - o Inventor
 - o Autocad Mechanical
- Installed DWF viewer onto multiple stations both in the office and out on the shop floor.

The following week after the initial installation ESS Technologies attended Inventor training to springboard their momentum with the new technology and capabilities.

Phase II

A new packaging design was chosen to use for ESS Technologies main 3d modeler. This was a new design that ESS Technologies was working on as a prototype for sales.



With the initial project assistance from Engineering Design Systems, Inc., ESS Technologies designed, analyzed and created final documentation for manufacturing with huge success. The new design and manufacturing of the machine in collaboration with others was performed in a five (5) month time frame and on the floor of a trade show for sales and marketing. The success of the Monoblock has allowed ESS Technologies to stay on the technological track and further pursue document management (Vault) and Autocad Electrical.

In May of 2005, Engineering Design Systems, Inc. upgraded and re-implemented all stations to AIS 10, Autocad Mechanical 2006 and Vault 4 document management. ESS Technologies has continued creating, managing and sharing their designs and have far exceeded the projected ROI of 20%.



American Safety Razor Corporation

ASRCO is a global corporation that designs and manufactures a vast array of razor blades and devices. The engineering based at their headquarters in Verona, Va. We were presented a task called "project 'C' ". This task started them looking at higher technology than they had been. Their current Cad applications were Autocad 2002, Personal Designer (IBM) and SDRC – Master Series v9. The current methodologies and collaborations were in major disarray. With the engineering group being presented this large project, they needed to not only find better processes and technologies, but to also formulate a business plan.

Engineering Design Systems, Inc. took a different approach than that with ESS Technologies. Over a three week period Engineering Design Systems, Inc. and American Safety Razor worked together on a shortened business plan for project "C". This business plan consisted of the projects time table based on the technical solutions that would be presented. Within the business plan was a financial plan based on an 18-24 month lifecycle.

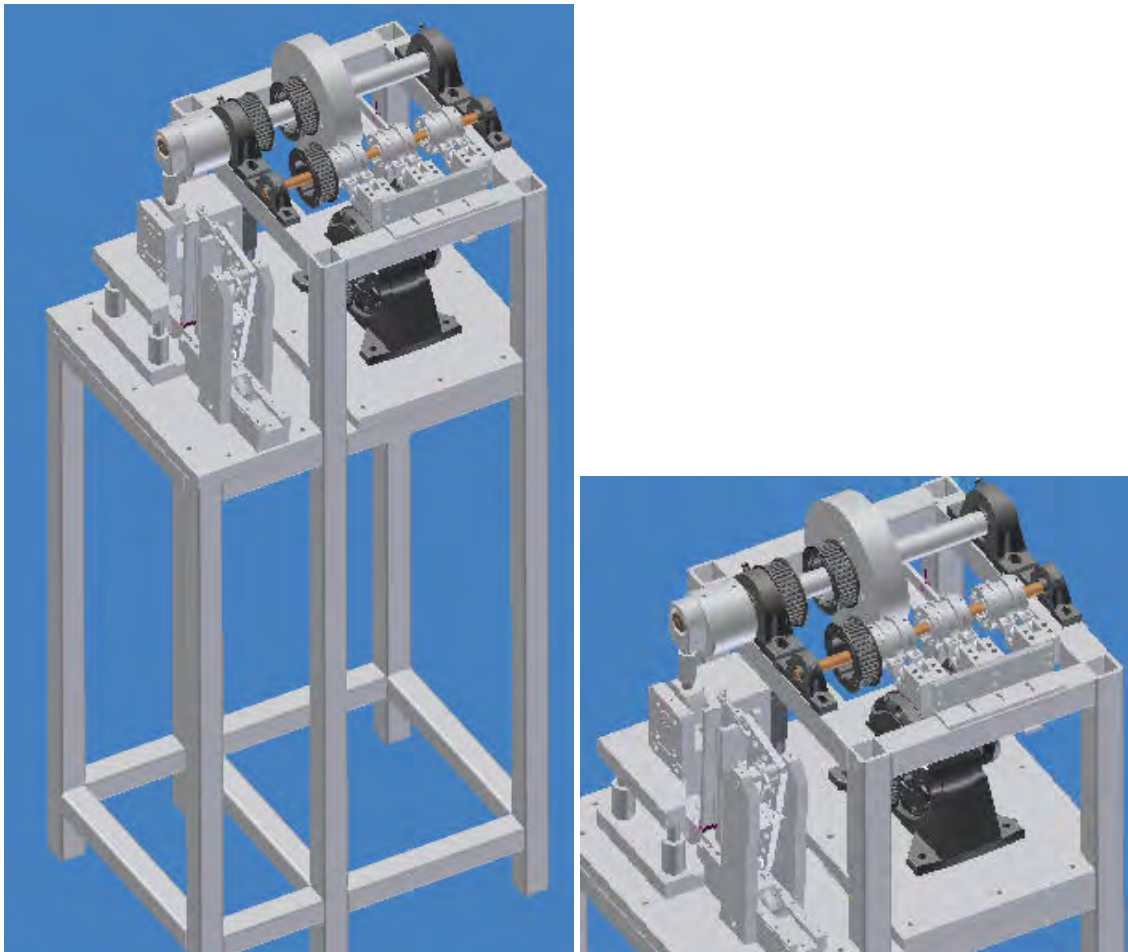
Engineering Design Systems, Inc. recommended that they set up a Cad committee that would have the power to research, listen to recommendations and make final solutions on the technical Cad direction. By the end of the fourth week American Safety Razor had in place a Cad committee of 5 individuals with an additional moderator from Engineering Design Systems, Inc.

Next, this small engineering department at American Safety Razor requested capital funding based on Engineering Design Systems, Inc. Autodesk Solutions. The initial expenditure was \$59,000 which entailed:

- Seven (7) new state of the art computers
- Four (4) Autocad to AIS upgrades
- Three (3) new seats Autodesk Inventor Series
- Implementation and configuration services from Engineering Design Systems, Inc.
- Autodesk Inventor Essential Training
- Autodesk Vault document management Training

Additional services that strategically are in the total solution package will be a complete translation and migration of Personal Designer Cad files. There are also three additional Engineers that need basic training on Autocad.

The success of these solutions has been noticed not just by the engineers involved, but other departments throughout their facility. One tremendous success was with an engineer who did not have experience with Cad creation and was able to design, analyze and create 2d drawings. This engineer had approximately 40 days to design a machine that could transfer very small razor blades down and to another machine. With some project assistance the engineer finished the design modeling and 2d drawings in 38 days allowing the manufacturing process to get head start.



Success of an Implementation Plan

A total solution and implementation plan comes together with a proper installation and custom configuration specific to that company. One of the main reasons a 2d/3d Cad solution succeeds or fails is the knowledge and capabilities of the end users. Training is essential to that success! Depending on the size of the solution and the company, it may be beneficial to phase the total solution in over time. With the proper steps taken to create strategies for success, these small companies are basking in new and expanded business.