IEEE CONSULTANTS' NETWORK OF CONNECTICUT
www.ieeecnct.org referral@ieeecnct.org

NEWSLETTER

June 1, 2001

published quarterly

CONSULTANTS' NETWORK OF CONNECTICUT (CNC)

CNC is associated with the Institute of Electrical and Electronics Engineers, Alliance of Independent Consulting Networks (AICN). CNC members are expert, independent contractors who can provide quick help and a can-do approach. Advantages of using CNC members are objectivity and generation of new ideas. Further, CNC members can supplement existing staff very cost effectively.

Officers of CNC are:

CHAIRMAN	**Bob Brown**	**860-489 8003**	**alta@ieee.org**
VICE CHAIRMAN	**Jim Ussailis**	**413-586 5111**	**ussailis@equinox.shaysnet.com**
SECRETARY	**Dr. Clem Skalski**	**860-673-7909**	**skalskic@skalski.com**
TREASURER	**Kevin Keegan**	**860-635-8105**	**ksquared@ieee.org**
MEMBERSHIP	**Harry Schaffer**	**203-227-6931**	**HarrySchaffer@compuserve.com**
AICN CORRESPONDING MEMBER	**Tom Freehill**	**860-886-4026**	**tomf@ectmicro.com**

NEWSLETTER

This is the first quarterly newsletter. These newsletters will be published electronically on the first of the month in which meetings are held. The publication will consist of brief e-mails pointing to a new posting at the CNC website. The Adobe Acrobat (.pdf) format will be used. The Acrobat reader is available as a free download from http://www.adobe.com/.

Each newsletter will contain general information and up to three articles written by group members. The membership is invited to submit articles to the editor, Clem Skalski. The articles should be approximately 1000 words in length and submitted as WORD documents. The articles preferably reflect on the services and expertise of the authors. Wide latitude is permitted in the format and content of the articles. The editor and at least one group member will review each article.

Reader feedback is invited and appropriate letters will be published.

MEETINGS

These are held quarterly on the third Wednesday of March, June, September, and December.

The next meeting is a special one. The Waterbury Information Technology Zone is hosting it. The 'Zone' is an area of Waterbury that has been designated for high tech business. The meeting will be held on June 20 at 7:00 at the Waterbury Chamber of Commerce on the fourth floor of 83 Bank Street in Waterbury. After networking, there will be a short presentation about what the 'Zone' is doing to attract technology business to the city of Waterbury.

The fall meeting is at ARRL, 225 Main Street, Newington on Wednesday, September 19 at 7:00 PM. The first half hour of the meeting is devoted to networking, with the business meeting starts at 7:30 PM. The atmosphere is casual and there is no admission fee.

INTRODUCTION TO ARTICLES

There are two articles that follow this section. One is titled "**XML – What is all the fuzz about?**" by **Thomas Freund**. Mr. Freund has 27 years of experience in software engineering in a variety of applications. He is currently developing both a scheduling system and a control system targeted to consumer applications where XML will be used as an information exchange protocol

Mr. Freund can provide development services for XML applications ranging from enterprise wide use to networked devices. He can also conduct introductory training in XML.

The second article is titled "**SUCCEEDING WITH INNOVATIVE PRODUCT IDEAS"** by **Clem Skalski**. Dr. Skalski has extensive experience as an engineer and inventor. He can offer assistance with inventions and product development, electromechanical systems, motors and drives, and controls. He is a proficient user of Matlab® and related software.

Summary: **XML – What is all the fuzz about** ? by Thomas Freund

The HyperText Markup Language, or HTML, standard has, in a relatively short time, transformed the Internet from a research pursuit to a key component of the world economy. As consultants, we are very much aware how it has opened new avenues of business.

But, the very success of HTML has, in a way, been its undoing. Electronic commerce applications have clearly demonstrated the potential of the Internet to streamline the way that organizations do business with their customers and suppliers. In the case of the latter, a business can clearly derive significant advantage in both delivery to the customer and internal operations if its software systems can communicate specifications and orders directly to the software systems of its suppliers for processing.

Exchanging specifications and orders, however, require a standard that can represent a large combination of possible information structures; something HTML cannot do well because it is geared more toward presentation of information on a display and not information exchange between systems. What this requires is a standard that is both flexible and extensible for system-to-system information exchange over the Internet. Enter XML.

This article provides a very brief introduction to what XML is and provides web sources if you want to find out more about XML and related efforts. Enjoy

Summary: **SUCCEEDING WITH INNOVATIVE PRODUCT IDEAS** by Dr. Clem Skalski

Developing successful products requires sound ideas and proper execution. Some of the critical steps in turning a product idea into a profitable product are outlined here. This is done in the context of the author's long career as an engineer and inventor. Besides having good business plans, it is essential to do all of the critical engineering, assuring that a product having high commercial viability results. The engineering can be carried out more quickly and effectively due to the availability of powerful software such as Matlab®, CAD (computer-aided design) and FEA (finite-element analysis) programs.

XML – What is all the fuzz about ?

Thomas Freund
Member IEEE, IEEECNC
WriteNCook@aol.com
http://www.scguild.com/usr/1149I.html

I. A (very !) brief history

XML, or eXtensible Markup Language, is a standard for structuring a document developed by the W3C Consortium; the same people that established the HTML standard used to create web pages. XML documents are portable, or platform independent, and its contents are structured as a hierarchy.

So, what's the big deal? Why XML? HTML has proven to be a successful platform for disseminating information through the Internet. However, it cannot be readily extended or changed to accommodate complex and varied information structures needed to enable communications between software systems across the Internet in a platform neutral manner. So, in the mid 1990's, an effort began to create what is now the current XML 1.0 standard.

For those of you familiar with EDI, XML is now viewed more and more as a viable alternative to EDI because of it flexibility and extensibility. Efforts are now underway to create standards for XML documents specific to various industry segments. But to better understand this, let's first take a look at what XML is.

II. What is an XML document?

a. The very basics

An XML document is basically a plain text file or message. The philosophy behind XML is that computer-to-computer information exchange can be accomplished through an information structure that is human readable yet structured in a way that software can scan and recognize its contents. This is known as the well formedness property of an XML document.

To illustrate, let's take a look at the sample XML document in Figure 1 below.

```
<?xml version="1.0" encoding="US-ASCII" standalone = "no">
<!DOCTYPE resettable_fuse SYSTEM "http://eia.org/xml/circuits/rfuse.dtd"?>
<resettable_fuse>
    <max_voltage>16</max_voltage>
    <max_current>100</max_current>
    <min_resistance>0.034</min_resistance>
    <rated_current>
            <hold>3.0</hold>
            <trip>5.1</trip>
    </rated_current>
</resettable _fuse>
```

Figure 1 – XML document specifying a resettable fuse

This document can be used, for example, by the purchasing system of an instrument manufacturer to place an order with the order entry system of a components supplier for fuses meeting the stated specifications.

The first line of the document that begins with “?xml” is used by the XML software receiving this document to indicate its XML document type. “version” indicates the version of the XML standard being used, currently always set to 1.0. The “encoding” describes the type of text being used, thus allowing use of various alphabets and ideograms (e.g. German, Spanish, etc.). “standalone” indicates whether or not the definition of the document is contained within the document itself (a value of “yes”) or must be retrieved from a different site (a value of “no”).

The second line beginning with “!DOCTYPE” provides the name of the document (“resettable_fuse” in this example). “SYSTEM” indicates the site where the definition of this document is located, (totally fictional in our case !). “SYSTEM” is included in this line since we indicated in the first line that the definition of this document is located outside of this document (standalone=”no”).

The remaining lines are a particular fuse specification based on the definition provided by the reference in the second line. Note how each of the **tags ,** surrounded by “<” and “>”, are paired with a corresponding tag surrounded by “</” and “>”; a technique also used in HTML. This is what well formedness is all about: creating a document where the bounds of its components are well defined in a way that is both human readable and software comprehensible. But, how are such document definitions built? That is the function of the Document Type Definition, or DTD.

b. Describing it: DTD

DTD’s are at the core of current efforts by various industry segments to create standard XML document definitions. To illustrate what they are, let’s take a look at the DTD for our resettable fuse specification in Figure 2. Though simple compared to other DTD’s, this one contains the most frequently used features.

```
<!ELEMENT resettable_fuse (max_voltage, max_current, max_resistance, rated_current>)
<!ELEMENT max_voltage (#PCDATA)>
<!ELEMENT max_current (#PCDATA)>
<!ELEMENT max_resistance (#PCDATA)>
<!ELEMENT rated_current (hold, trip)>
<!ELEMENT hold (#PCDATA)>
<!ELEMENT trip (#PCDATA)>
```

Figure 2 – DTD for a resettable fuse specification

The first line describes the “top-most” element in the document hierarchy which, as shown in Figure 1, is resettable_fuse. It is also taken as the name of this DTD. The list of elements inside the parentheses are its immediate ‘children’ in the hierarchy. Note that the fifth line is also a hierarchy. Thus, the ‘children’ of an element can also be other hierarchies.

The remaining lines (2 through 4, 6 and 7) contain the actual data being carried by this document and that is what the #PCDATA designation is all about. #PCDATA stands for parsed character data. The numbers shown in Figure 1 are treated as text that is scanned and, in our example, converted to numeric data for processing by the order entry system of the fuse supplier.

c. Understanding it: SAX and DOM

Now that we have defined a standard DTD for specifying a resettable fuse, the order entry system has a reference point for scanning the specification in Figure 1, processing it, and providing an XML document that describes fuses that the supplier has available. End of story ? Not quite.

The response XML document can be sent to the instrument manufacturer's purchasing system as a text message generated by the supplier's order system and dispatched via the Internet. But, how does the software scan the specification in Figure 1 ? Enter SAX and DOM.

Simple API for XML, or SAX, and Document Object Model, or DOM, are two approaches to scanning or parsing an XML document. SAX was originally developed as an library of components for the Java programming language that parse XML documents based on a DTD. So, all SAX parsers are written in Java. DOM was specified by the W3C consortium as a language independent model for creating XML parsers.

All programming language issues aside, the key difference between DOM and SAX is the way that each methodology looks at processing an XML document. DOM brings the entire document into memory as an object before scanning and processing it. On the other hand, SAX scans the XML document one feature at a time. That is, in our example, a SAX parser will first read in the "<resettable_fuse>" tag and process it, read in the "<max_voltage>" tag and process it, read its data and process it, and so on ....

In either case, the important thing is that either methodology is a well established standard and adequate to the task of parsing an XML document. In both cases, the DTD is retrieved and used as the reference point to check and process an XML document.

III. What's the point ?

Wonderful ! So what ? DTD's such as these are stored in web sites which can be made public or accessible to a select group of users; just like any other web site. However, this implies in our example that our DTD for resettable fuses can be used by the purchasing system of other electronic equipment manufacturers and the order entry system of other electronic component suppliers. In effect, we can have a 'community' whose members are electronic equipment manufacturers and suppliers that own this particular XML document definition as a standard means for exchanging queries and orders for circuit components.

This is the key strength of XML going forward: the ability to use a highly flexible standard to create document definitions that allow the system-to-system exchange of information and knowledge between organizations and/or individuals within an industry. Thus, not only orders, but also design knowledge can be exchanged between systems.

We can, for example, have two design systems exchange SPICE simulation models expressed as an XML document based on a SPICE DTD that describes the elements of a SPICE model.

IV. Some helpful sources

We have only touched briefly on the world of XML. To find out more, point your browser to any of these sites on XML and its applications:

URL	Description
http://www.w3.org/XML/	THE source for XML
http://www.w3.org/Math/	MathML: an XML variant whose goal is to use mathematics as a basis for machine-to-machine communication. This is as an example for exchange of design knowledge transfer via simulation models
http://www.w3.org/RDF/	RDF, or Resource Description Framework, is another variant of XML that is targeted for exchange of knowledge and can, for example, be used by networked devices to exchange information. Thus, it can be used as an alternative protocol where devices can "discover" each others capabilities
http://www.cidx.org/commerce/what.html	Chem eStandards – an XML based standard for product information exchange in the chemical industry. DTD's available for download
http://www.interfacecontrol.com/sml/	SML (Spacecraft Markup Language) – an XML based standardization effort for exchange of spacecraft information such as telemetry data
http://www.si2.org/ecix/	ECIX (Electronic Component Information Exchange) - An information exchange architecture for the electronics industry based on the use of XML
http://www.si2.org/ECIX/tdml/	TDML (Timing Diagram Markup Language) – an initiative to create an XML-based standard for exchange of timing diagrams for digital circuits
http://xml.oreilly.com/	A good source of books and news about XML

SUCCEEDING WITH INNOVATIVE PRODUCT IDEAS

Dr. Clem Skalski
Skalski Associates
www.skalski.com

SUMMARY
Developing successful products requires sound ideas and proper execution. Some of the critical steps in turning a product idea into a profitable product are outlined here. This is done in the context of the author's long career as an engineer and inventor. Besides having good business plans, it is essential to do all of the critical engineering, assuring that a product having high commercial viability results. The engineering can be carried out more quickly and effectively due to the availability of powerful software such as Matlab®, CAD (computer-aided design) and FEA (finite-element analysis) programs.

THE NEED TO INNOVATE
Innovation is a well-recognized key to business success. Innovation, as used here, is the creation of new products with the aim of providing business advantage and profit. In a more general sense, business innovation is finding new ways of pleasing customers.

Ideas can come from anyone. The CEO of a company or a factory worker may have the idea; it could be a customer; it could be an entrepreneur; it could be a professor or a student; or it could be a homeowner. Innovative ideas may originate from a variety of individuals, but they require a dedicated and expert group of people to turn them into successful market-ready products.

The idea of newness is key to innovation, but most new ideas have little or no commercial merit. The ability to screen, refine, and capitalize upon ideas is what makes winners. Engineers are well suited to this for reasons such as these:

- Analytical, rational method of problem solving
- Knowledge of scientific principles
- Knowledge of design, fabrication, and production arts
- Strong computer skills
- Often highly motivated and profit oriented
- Many engineers have business management skills
- Many engineers have diverse interests

It's important to think beyond the obvious, getting results without excessive expenditures for screening and failed efforts. There is a need to cultivate ideas that appear good and suppress those that will go nowhere. This is a difficult process.
.

SCREENING IDEAS

At some level, everyone has the ability to screen ideas. What's addressed here is the screening of ideas for potentially profitable products, using methods that have proven effective. The screening is done in the context of investment: will the expended resources provide an adequate return? When dealing with a technically advanced product, it is essential to determine the following:

1. Will it work as intended?
2. Will it result in a viable business?

Both questions must be answered. The second question is the main issue, but the first question is an absolutely necessary condition. Repeatedly during his career the author has witnessed situations in which an unworkable product was being pushed to market. Failure in product innovation does occur. It is a risky business, but a huge amount of money can be saved by good, *upfront* technical work. Before spending the money to commercialize a product, the following three steps are essential.

Preliminary Business/Economic Plan

Commercial viability of a product idea must be assessed. This is based on assumptions of having the fully developed product and then putting it on the market. In a formal preliminary business/economic plan it must be shown that commercial viability is a reality before continuing. This type of plan is arguable because it is based on many assumptions. Certainty is developed using the following process.

Feasibility Analysis

Feasibility analysis needs to be done by an engineer or engineering team. The preliminary plan is often based on a "back-of-the-envelope" design. At this stage, especially with availability of powerful computer programs such as Matlab®, CAD and FEA programs, feasibility can be established more quickly and with less expense than previously. These are powerful tools that require skillful use. Past experience has shown that marginal ideas not subjected to thorough scrutiny have led either to high product development costs and/or abandonment.

Now that the product design has been "roughed-out" at this point, does it provide advantages over competing products? Knowledge of the market is essential. Further, a patent search is often desirable. Patent attorneys can be retained at this point. An alternative approach is to have the patent search done by the engineer carrying out the feasibility study. This can be done economically using the Internet. The United States Patent and Trademark Office (www.uspto.gov) is a good place to begin. Free, high-quality patent information can be obtained by adding a $19.95 browser plug-in from Cartesian Products, Inc. (www.cartesianinc.com). More costly, but more convenient, is Micropatent (www.micropat.com). A search of literature other than patents may also be justified.

Product Vision

A product needs to be championed to succeed. Promoters must be able to explain to others what the product is about, since product introduction is a team effort requiring many skills. Financial backers and other supporters need to be convinced that the proposed product has sufficient merit to justify risk. The product plan spells out the essentials: the product design, its merits, the risks, the costs, and the returns. A product “hallucination” is to be avoided.

PROOF OF CONCEPT

A proof of concept is highly desirable. At this point something concrete will be designed and implemented. It could, for example, be a model of a new and wondrous toaster that works perfectly each time. You’ve seen many toaster designs, yet how many work really well? Or, it could be a product never seen before. Either way, a working model is essential to reducing financial risk.

The proof-of-concept product stage should include a concept review to determine if product development is justified. This review must include more than demonstration of a model to investors. A thorough review must include affirmative answers to all of these questions:

1. Based on final product requirements, does the model demonstrate all essential features?
2. Is the functioning of the product thoroughly understood, as evidenced by analyses and engineering reports?
3. Does the demonstration prove that further “invention” is not required during development?
4. Can the product be made at competitive cost, be safe, be reliable, meet environmental requirements, and please the customer?

Lack of affirmative answers to any of these questions indicates trouble. Expenditures to this point are relatively minor; however, without affirmation of the product concept one must decide whether it requires further conceptual work or abandonment. Sufficient effort at the formative stages of a product is critical.

INTEGRATED PRODUCT DEVELOPMENT TEAM

The use of integrated product development teams is an established method. It makes sense to have all of the parties—the development team, the production group, and sales team—working together. Assuming a well-staged product at the proof-of-concept point, an integrated team is an especially vital component to ensure commercial success.

GETTING IT DONE

The steps defined here are the most basic to succeeding with innovative product ideas. All of these steps could be carried out in-house by a large organization. However, even a large organization may want to use experienced consultants for specialized skills and perspectives. Also, a product idea may suit a company's business objectives, yet not be aligned with most of the engineering and production skills available in-house. This situation is more likely for smaller firms. Use of consultants teamed with a specialized manufacturing company may be the most effective way to achieve an organization's business goals. Individual inventors who are not technical specialists may seek the services of an engineering consultant to define their product idea to the point of patentability and subsequent licensing to a manufacturer.