

ABACUS

E.F. Schumacher  
**Small  
is Beautiful**



A STUDY OF ECONOMICS  
AS IF PEOPLE MATTERED



ABACUS

E.F. Schumacher  
**Small  
is Beautiful**



A STUDY OF ECONOMICS  
AS IF PEOPLE MATTERED

# Small Is Beautiful

A talk on code as if  
people mattered

A talk on code as if  
economics mattered

@KevlinHenney

**Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.**

The Report of the Brundtland Commission

ABACUS

E.F. Schumacher  
**Small  
is Beautiful**

**For every activity there is a  
certain appropriate scale.**

A STUDY OF ECONOMICS  
AS IF PEOPLE MATTERED

**To be, or not to be: that is the question:  
Whether 'tis nobler in the mind to suffer  
The slings and arrows of outrageous fortune,  
Or to take arms against a sea of troubles,  
And by opposing end them?**

William Shakespeare  
*Hamlet*

**Continuing existence or cessation of existence: those are the scenarios. Is it more empowering mentally to work towards an accommodation of the downsizings and negative outcomes of adversarial circumstance, or would it be a greater enhancement of the bottom line to move forwards to a challenge to our current difficulties, and, by making a commitment to opposition, to effect their demise?**

Tom Burton  
*Long Words Bother Me*

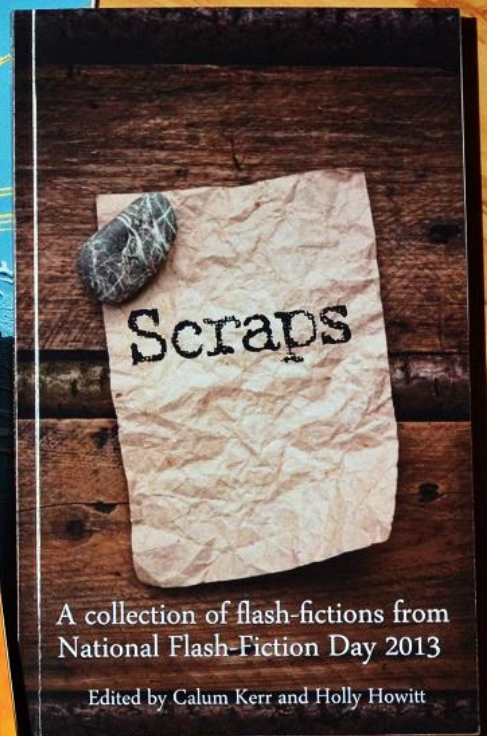
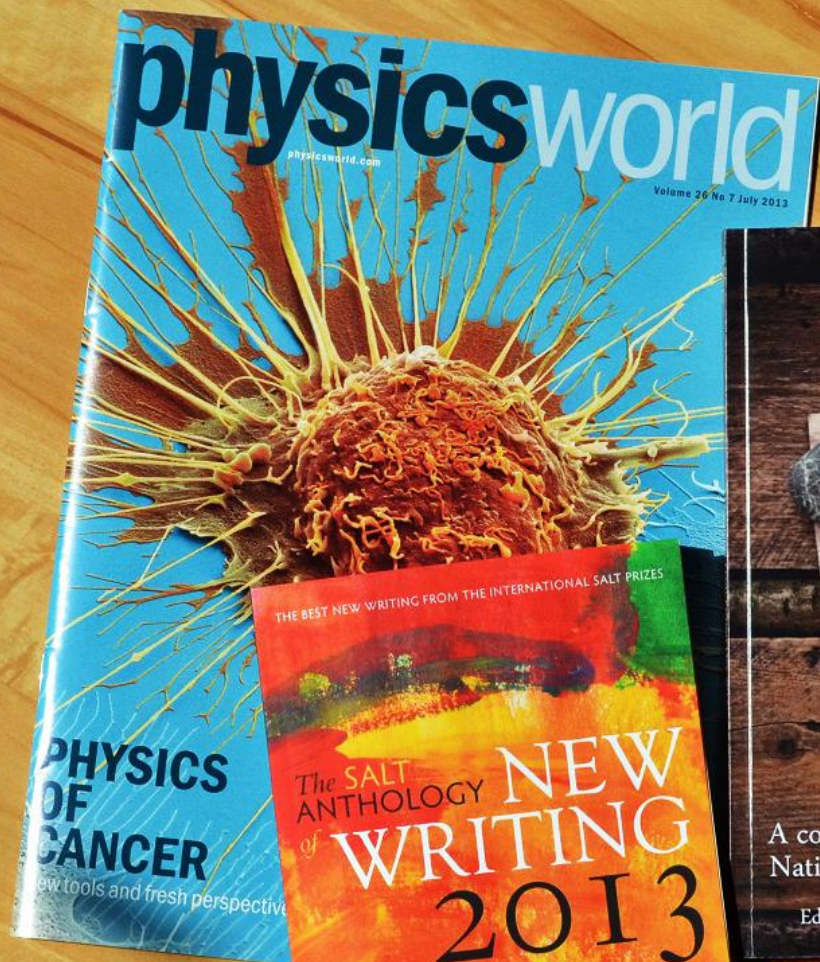
**Continuing existence or cessation of existence:**

**those are the  
more empow  
to work towa  
accommodat  
downsizings  
outcomes of  
circumstance  
a greater enh  
the bottom li  
forwards to a  
our current c  
by making a  
opposition, t  
demise?**

**This is the monstrosity in love, lady, that  
the will is infinite, and the execution  
confined; that the desire is boundless, and  
the act a slave to limit.**

William Shakespeare  
*Troilus and Cressida*









WILEY SERIES IN  
SOFTWARE DESIGN PATTERNS

# PATTERN-ORIENTED SOFTWARE ARCHITECTURE

On Patterns and Pattern Languages



**Volume 5**

Frank Buschmann  
Kevlin Henney  
Douglas C. Schmidt

**At some level  
the style  
becomes the  
substance.**



/THEORY/IN/PRACTICE

# Beautiful Code

Leading Programmers Explain How They Think

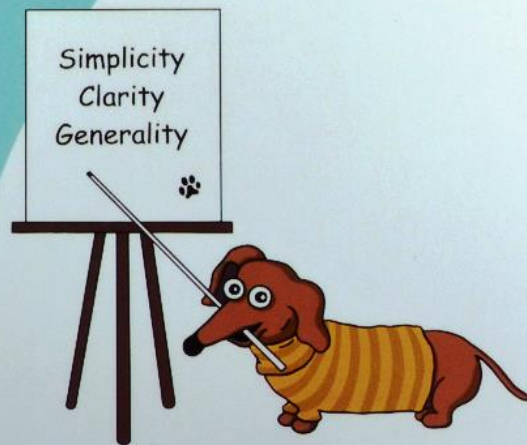
O'REILLY®

Edited by Andy Oram & Greg Wilson



# The Practice of Programming

Brian W. Kernighan  
Rob Pike

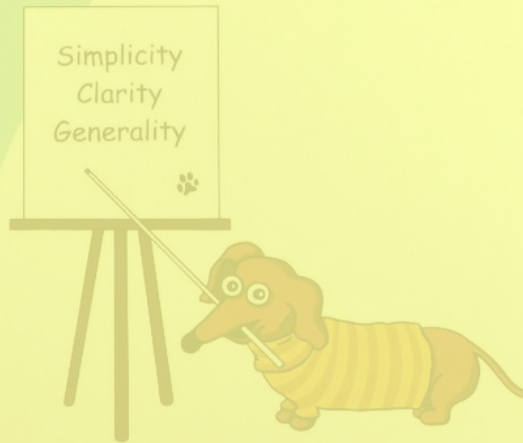


ADDISON-WESLEY PROFESSIONAL COMPUTING SERIES



# The Practice of Programming

Brian W. Kernighan  
Rob Pike



ADDISON-WESLEY PROFESSIONAL COMPUTING SERIES

```
/* grep: search for regexp in file */
int grep(char *regexp, FILE *f, char *name)
{
    int n, nmatch;
    char buf[BUFSIZ];

    nmatch = 0;
    while (fgets(buf, sizeof buf, f) != NULL) {
        n = strlen(buf);
        if (n > 0 && buf[n-1] == '\n')
            buf[n-1] = '\0';
        if (match(regexp, buf)) {
            nmatch++;
            if (name != NULL)
                printf("%s:", name);
            printf("%s\n", buf);
        }
    }
    return nmatch;
}

/* matchhere: search for regexp at beginning of text */
int matchhere(char *regexp, char *text)
{
    if (regexp[0] == '\0')
        return 1;
    if (regexp[1] == '*')
        return matchstar(regexp[0], regexp+2, text);
    if (regexp[0] == '$' && regexp[1] == '\0')
        return *text == '\0';
    if (*text != '\0' && (regexp[0] == '.' || regexp[0] == *text))
        return matchhere(regexp+1, text+1);
    return 0;
}

/* match: search for regexp anywhere in text */
int match(char *regexp, char *text)
{
    if (regexp[0] == '^')
        return matchhere(regexp+1, text);
    do { /* must look even if string is empty */
        if (matchhere(regexp, text))
            return 1;
    } while (*text++ != '\0');
    return 0;
}

/* matchstar: search for c*regexp at beginning of text */
int matchstar(int c, char *regexp, char *text)
{
    do { /* a * matches zero or more instances */
        if (matchhere(regexp, text))
            return 1;
    } while (*text != '\0' && (*text++ == c || c == '.'));
    return 0;
}
```

[http://thad.frogley.info/archive/the\\_greatest\\_program.html](http://thad.frogley.info/archive/the_greatest_program.html)

[illegible]

begin 644 FLOPPY.7Z

M-WJ\KR<<` `/ \$P0TX"0, ````````! = ````````````````):A<QL`=0%+!`0%F,\C).-Z  
M;\$=\*5]JZ\`-6,?XTW!KSPJ'1-6G\$ARFF9!HS3,#)' )1N7\*D;8SS;"#0\60AE  
M-[CNTB+D/0Z9#=:\_9P2KN#\MYXC�QEJ4BH1SX>/1=Y.`CHNM%WS\8U`\$`F]A  
ME2F#R\_9K`29FA1V18\#-B:U'D\*!T7:#C@1E\F9V(:ADLP`IM:\_8Y\*V'DZ8&R  
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M[WY\$\$I90UY2)N@1,XML;SK@NNA3&38?K<%CX1W4"L5!5W2S395P18V+\0=V"  
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MYP8KC)<=B(;IT":8((FP%\_\*K904!T?\7\4K,+ .C040HG9SC[0["\!W"M%\_L^  
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M,Y2F890+C'`)T1\$B258[[S\F6D>&=F>2@"56SM+N&<\B+\Z\_G-H`/JTFF\$``  
MC[496E4YX;VB/E9E?DCTT'16@YP\$;LR]V>B\*K9<M\_R[KFAVZSK\$G&%Q9ANEF  
M4EB^Z7:L6>3E6P4(^<?:K?S[4BMTS1Y;(\$+YW5,]^"ED"3N`RRILW[4[\,2]  
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M4\_CUD38Q!:6P[F\_!<\$U'#-&1\$:JM8!VZSK\$G&%Q9ANEF4EB^Z7:L\*"W<Q``!  
M!`8``0F#"0`'"P\$``2,#`0\$%70``&``,U@"````@\*`3?;3\$L```4!\$1T`0@!0  
M`&\`= `!#`&@`90!S`',`+@!I`&T`9P````!0\*`0!.7V=GM#G0`14&`0`@(```  
"````

end



A work of art is the  
unique result of a  
unique temperament.

*Oscar Wilde*

The more constraints one  
imposes, the more one frees  
one's self. And the arbitrariness  
of the constraint serves only to  
obtain precision of execution.

*Igor Stravinsky*

*"After 20 years, this is still the best exposition of the workings of a 'real' operating system."*  
Ken Thompson

# Lions' Commentary on UNIX® 6th Edition with Source Code

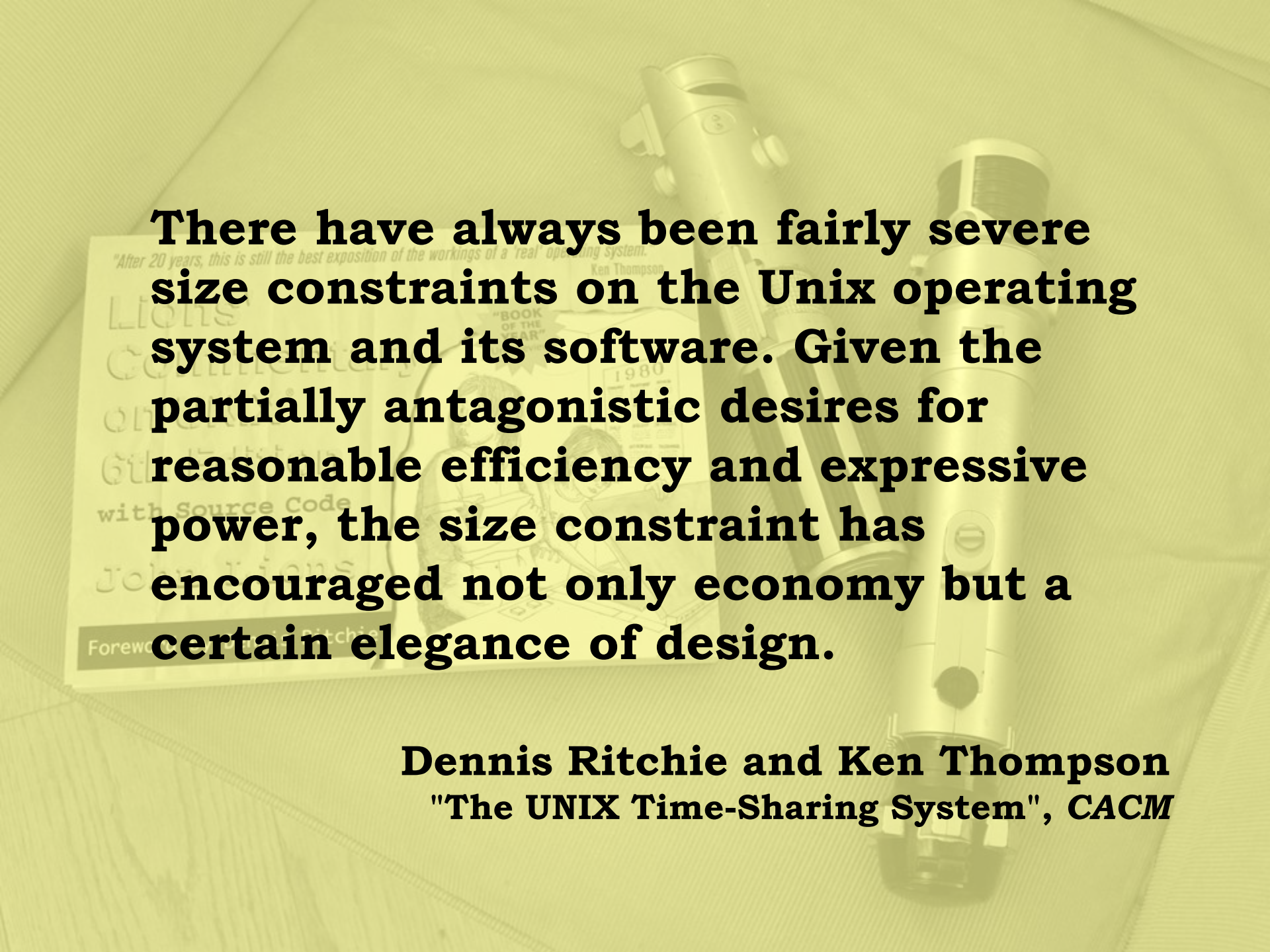
John Lions

Foreword by Dennis Ritchie

"BOOK  
OF THE  
YEAR"  
Unix Review





The background of the slide features a light green, textured surface. Overlaid on this are two faint, semi-transparent images. On the right side, there is a vertical image of a microscope. On the left side, there is a book cover for 'The UNIX Time-Sharing System' by Dennis Ritchie and Ken Thompson. The book cover includes a quote from 'LION'S' magazine: 'After 20 years, this is still the best exposition of the workings of a real operating system.' and mentions 'with Source Code'.

**There have always been fairly severe size constraints on the Unix operating system and its software. Given the partially antagonistic desires for reasonable efficiency and expressive power, the size constraint has encouraged not only economy but a certain elegance of design.**

**Dennis Ritchie and Ken Thompson**  
**"The UNIX Time-Sharing System", CACM**



Almost 19 years ago, when I was Byte magazine's executive editor and Web developer, I received the following email:

From: Ward Cunningham  
Subject: wiki  
Date: May 22, 1996 at 11:23:10 AM PDT  
To: Jon Udell

Jon -- So what do you think of wiki? I put it up a year and a half ago when HTML authoring tools were in short supply. I think it has held up pretty well, though I suppose its days are numbered. Still, there is something about it we call WikiNature that is in short supply on the net and in computers in general. Regards. -- Ward

```

#!/usr/bin/perl
# ----- PerlInterpreter
# PerlInterpreter must be the first line of the file.
#
# Copyright (c) 1995, Cunningham & Cunningham, Inc.
#
# This program has been generated by the HyperPerl
# generator. The source hypertext can be found
# at http://c2.com/cgi/wikibase. This program belongs
# to Cunningham & Cunningham, Inc., is to be used
# only by agreement with the owner, and then only
# with the understanding that the owner cannot be
# responsible for any behaviour of the program or
# any damages that it may cause.
# ----- InitialComments

```

```

# InitialComments
print "Content-type: text/html\n\n";
$DBM = "/usr/ward/$ScriptName";
dbmopen(%db, $DBM, 0666) || &AbortScript("can't open $DBM");
$CookedInput{browse} && &HandleBrowse;
$CookedInput{edit} && &HandleEdit;
$CookedInput{copy} && &HandleEdit;
$CookedInput{links} && &HandleLinks;
$CookedInput{search} && &HandleSearch;
dbmclose (%db);
if ($ENV{REQUEST_METHOD} eq POST) {
    $CookedInput{post} && &HandlePost;
}
# &DumpBinding(*CookedInput);
# &DumpBinding(*old);
# &DumpBinding(*ENV);
# ----- WikiInHyperPerl

```



**Chris Oldwood**

@chrisoldwood



Them: "Isn't a netbook screen a bit small?"  
Me: "No. If the code doesn't fit on it, it's too complicated."

9:36 AM - 21 Mar 2015

**37** RETWEETS **16** FAVORITES



<https://twitter.com/chrisoldwood/status/579215003531763712>

Eschew the monumental.  
Shun the Epic. All the guys  
who can paint great big  
pictures can paint great  
small ones.

Ernest Hemingway



ABACUS

E.F. Schumacher

Small

Today, we suffer from an almost universal idolatry of giantism. It is therefore necessary to insist on the virtues of smallness — where this applies.

A STUDY OF ECONOMICS  
AS IF PEOPLE MATTERED

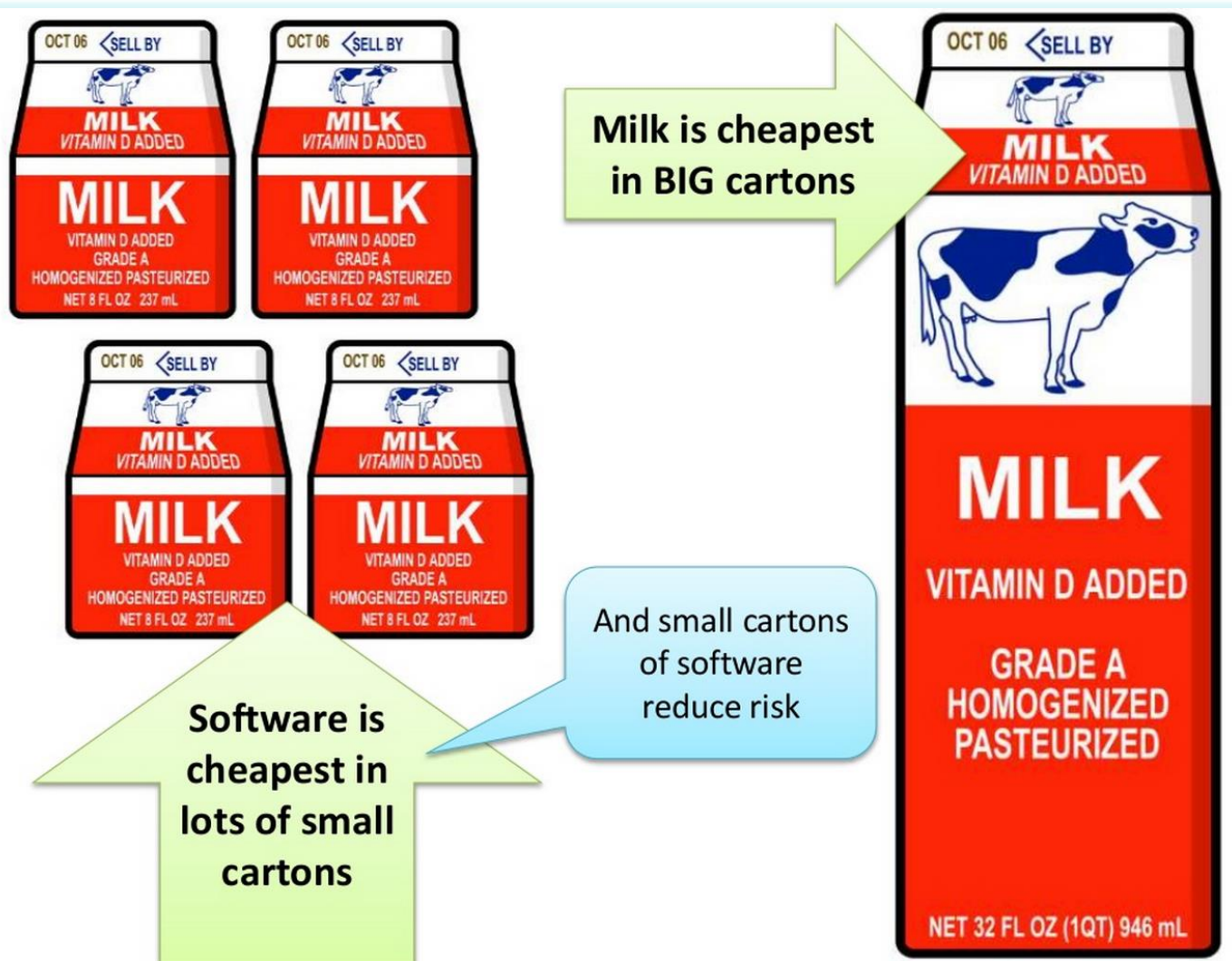
**Software development does *not* have economies of scale.**

**Development has *diseconomies* of scale.**

**Allan Kelly**

*Beyond Projects*

<http://www.slideshare.net/allankellynet/no-procects-beyond-projects-refreshed-version>



**Allan Kelly**  
*Beyond Projects*

<http://www.slideshare.net/allankellynet/no-projects-beyond-projects-refreshed-version>



ABACUS

E.F. Schumacher

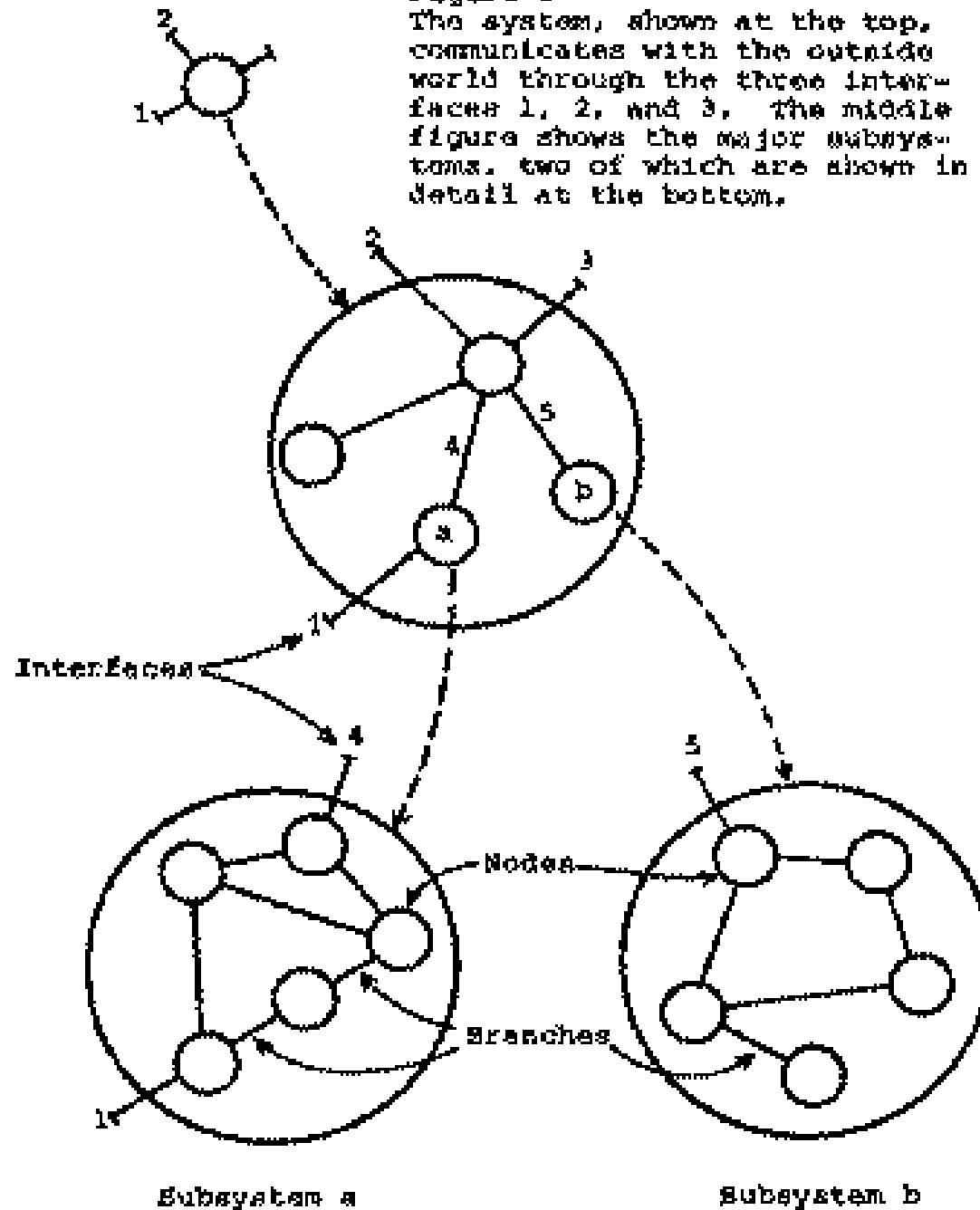
Small

I say, therefore, that we think *with*  
or *through* ideas and that what we  
call thinking is generally the  
application of pre-existing ideas to  
a given situation or set of facts.

A STUDY OF ECONOMICS  
AS IF PEOPLE MATTERED



Figure 1  
The system, shown at the top, communicates with the outside world through the three interfaces 1, 2, and 3. The middle figure shows the major subsystems, two of which are shown in detail at the bottom.



**The basic thesis [...] is that organizations which design systems [...] are constrained to produce designs which are copies of the communication structures of these organizations.**

Figure 1  
The system, shown at the top, communicates with the outside world through the three interfaces 1, 2, and 3. The middle shows the major subsystems of the system in detail at the bottom.

Interfaces

Nodes

Branches

Subsystem a

Subsystem b

**Melvin Conway**  
***How Do Committees Invent?***

## View Definition: Conway's Law

### Conway's Law

---

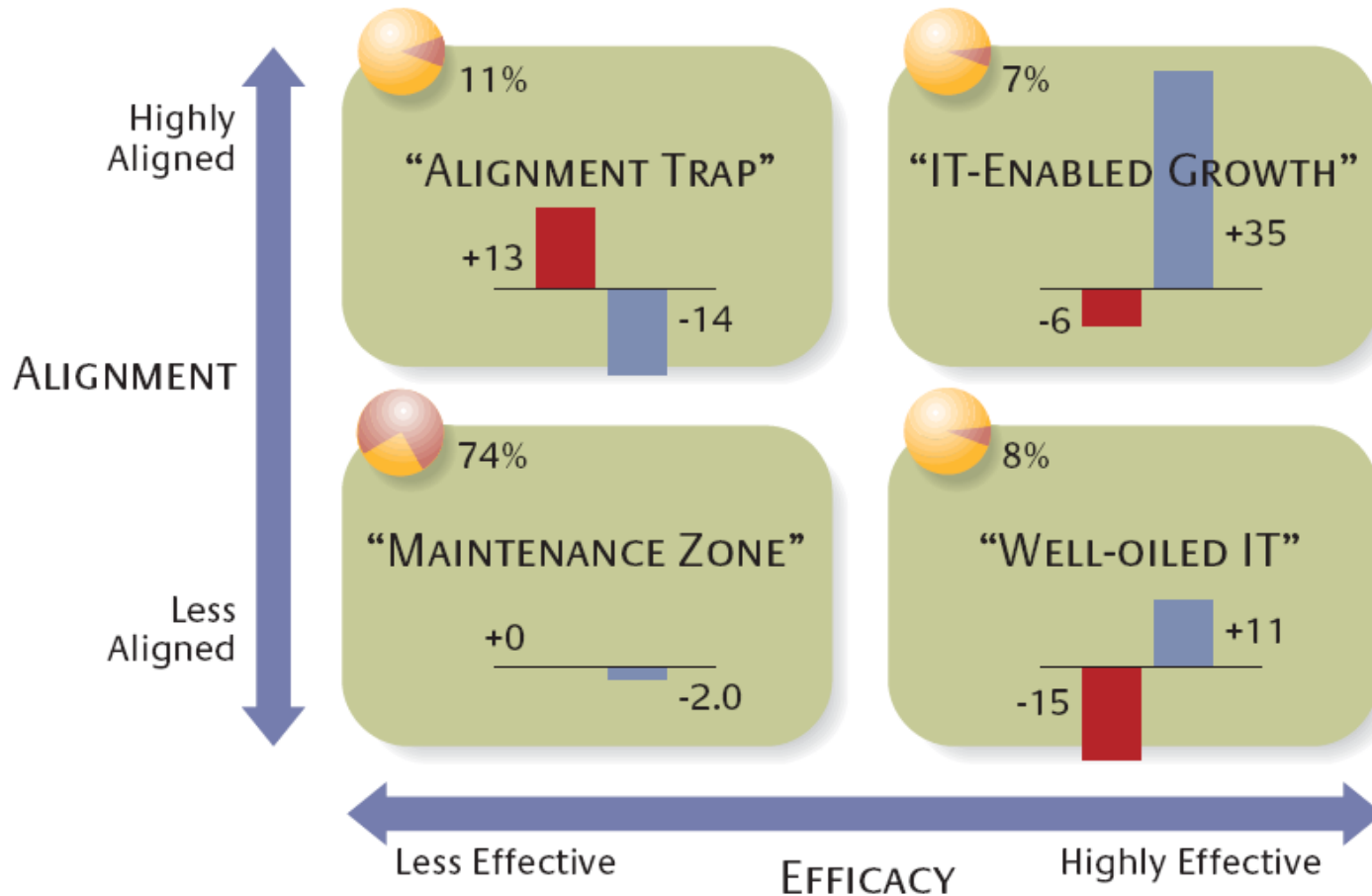
prov. The rule that the organization of the software and the organization of the software team will be congruent; originally stated as "If you have four groups working on a compiler, you'll get a 4-pass compiler".

This was originally promulgated by Melvin Conway, an early proto-hacker who wrote an assembler for the Burroughs 220 called SAVE. The name `SAVE' didn't stand for anything; it was just that you lost fewer card decks and listings because they all had SAVE written on them.

**IT's effort to satisfy its various (and sometimes conflicting) business constituencies created a set of Byzantine, overlapping systems that might satisfy individual units for a while but did not advance the company's business as a whole.**

David Schpilberg, Steve Berez, Rudy Puryear and Sachin Shah  
"Avoiding the Alignment Trap in Information Technology"  
*MIT Sloan Management Review*  
<http://sloanreview.mit.edu/article/avoiding-the-alignment-trap-in-it/>





% of Respondents  
(n=504)

Differences in Percentage  
compared to overall averages



IT  
Spending



3-Year Sales  
Compound  
Annual  
Growth Rate

**Aligning a poorly performing IT organization to the right business objectives still won't get the objectives accomplished.**

**Richard F Connell**

David Schpilberg, Steve Berez, Rudy Puryear and Sachin Shah  
"Avoiding the Alignment Trap in Information Technology"  
*MIT Sloan Management Review*  
<http://sloanreview.mit.edu/article/avoiding-the-alignment-trap-in-it/>

Cargo cult programming is a style of computer programming characterized by the ritual inclusion of code or program structures that serve no real purpose.

Cargo cult programming can also refer to the results of applying a design pattern or coding style blindly without understanding the reasons behind that design principle.

*[http://en.wikipedia.org/wiki/Cargo\\_cult\\_programming](http://en.wikipedia.org/wiki/Cargo_cult_programming)*

# FizzBuzzEnterpriseEdition

build passing

Enterprise software marks a special high-grade class of software that makes careful use of relevant software architecture design principles to build particularly customizable and extensible solutions to real problems. This project is an example of how the popular FizzBuzz game might be built were it subject to the high quality standards of enterprise software.

## FizzBuzz












FizzBuzz is a game that has gained in popularity as a programming assignment to weed out non-programmers during job interviews. The object of the assignment is less about solving it correctly according to the below rules and more about showing the programmer understands basic, necessary tools such as `if` `-/` `else` -statements and loops. The rules of FizzBuzz are as follows:

For numbers 1 through 100,

- if the number is divisible by 3 print Fizz;
- if the number is divisible by 5 print Buzz;
- if the number is divisible by 3 and 5 (15) print FizzBuzz;
- else, print the number.



[FizzBuzzEnterpriseEdition](#) / [src](#) / [main](#) / [java](#) / [com](#) / [seriouscompany](#) / [business](#) / [java](#) / [fizzbuzz](#) / [packagenamingpackage](#) / [interfaces](#) / **factories** / +

Merge #127		2 comments 
 Dmitry-Me authored on 22 Jul 2014		latest commit <a href="#">aad80defc4</a> 
..		
 <a href="#">FizzBuzzOutputStrategyFactory.java</a>	Adding a factory to create the output strategy so that we never get I...	a year ago
 <a href="#">FizzBuzzSolutionStrategyFactory.j...</a>	Problem solution should be instantiated through factory class to make...	2 years ago
 <a href="#">IntegerPrinterFactory.java</a>	Move sources	2 years ago
 <a href="#">IntegerStringRetumerFactory.java</a>	Move sources	2 years ago
 <a href="#">IsEvenlyDivisibleStrategyFactory.java</a>	Move sources	2 years ago
 <a href="#">OutputGenerationContextVisitorFac...</a>	Merge #127	8 months ago
 <a href="#">StringPrinterFactory.java</a>	Move sources	2 years ago
 <a href="#">StringStringRetumerFactory.java</a>	Move sources	2 years ago

**I have yet to see any problem,  
however complicated, which,  
when you looked at it in the  
right way, did not become still  
more complicated.**

**Anderson's Law**



**Paul McMahon**

@pwim

 Follow

All code is technical debt; some code just has a higher interest rate.

7:13 AM - 29 Dec 2014

**139** RETWEETS **97** FAVORITES



<https://twitter.com/pwim/status/549463179084853248>





BDJ	\$7.5300	ETV	\$12.9200	JPS	\$9.4700	NFI	\$16.7800
BGY	\$7.4464	ETW	\$11.1700	JPZ	\$12.6074	PCK	\$10.6500
BOE	\$13.8216	FFA	\$12.2500	JOC	\$9.7500	PCQ	\$15.3900
CI	\$13.8300	FLC	\$21.2200	JSH	\$12.6200	PMF	\$16.2910
CMU	\$13.5810	GEO	\$19.5100	MAD	\$15.8000	PML	\$13.0900
DPD	\$14.0000	GPM	\$9.0700	MAI	\$9.8400	PMX	\$12.8500
DPO	\$11.0600	HIO	\$16.1001	MAZ	\$15.5000	PNF	\$12.7300
EON	\$11.1800	JHP	\$9.1495	NUH	\$15.4799	PHI	\$13.6100
EOS	\$11.1182	JPC	\$9.8400	NUO	\$19.1500	PYN	\$10.5310
ETB	\$15.2700	JPG	\$14.4200	NUV	\$10.3900	PZC	\$11.4100

CMU +5.0400 5.04 5.05  
53.874 5.03 5.05 5.02

**MFS**  
INVESTMENT MANAGEMENT

HEQ +16.2101 16.21 16.25  
30.194 16.18 16.35 16.18

*John Hancock*

PNF 100 @ 12.7300

GEO +19.5100 19.51 19.59  
24.003 19.69 19.72 19.51

**GUGGENHEIM INVESTMENTS**

JPS +9.4700 9.46 9.47  
221.392 9.57 9.57 9.46

**NUVEEN**  
Investments


NUH 550 @ 15.4799

ABR	\$14.0000	GLD	\$12.0000	GLD	\$12.0000	GLD	\$12.0000
APL	\$12.0000	GLD	\$12.0000	GLD	\$12.0000	GLD	\$12.0000
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APL	\$12.0000	GLD	\$12.0000	GLD	\$12.0000	GLD	\$12.0000
APL	\$12.0000	GLD	\$12.0000	GLD	\$12.0000	GLD	\$12.0000
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APL	\$12.0000	GLD	\$12.0000	GLD	\$12.0000	GLD	\$12.0000
APL	\$12.0000	GLD	\$12.0000	GLD	\$12.0000	GLD	\$12.0000

Knight

gettyimages®  
Bloomberg






**Knight Capital Group realized a \$460 million loss in 45 minutes.**

***Doug Seven***

<http://dougseven.com/2014/04/17/knightmare-a-devops-cautionary-tale/>

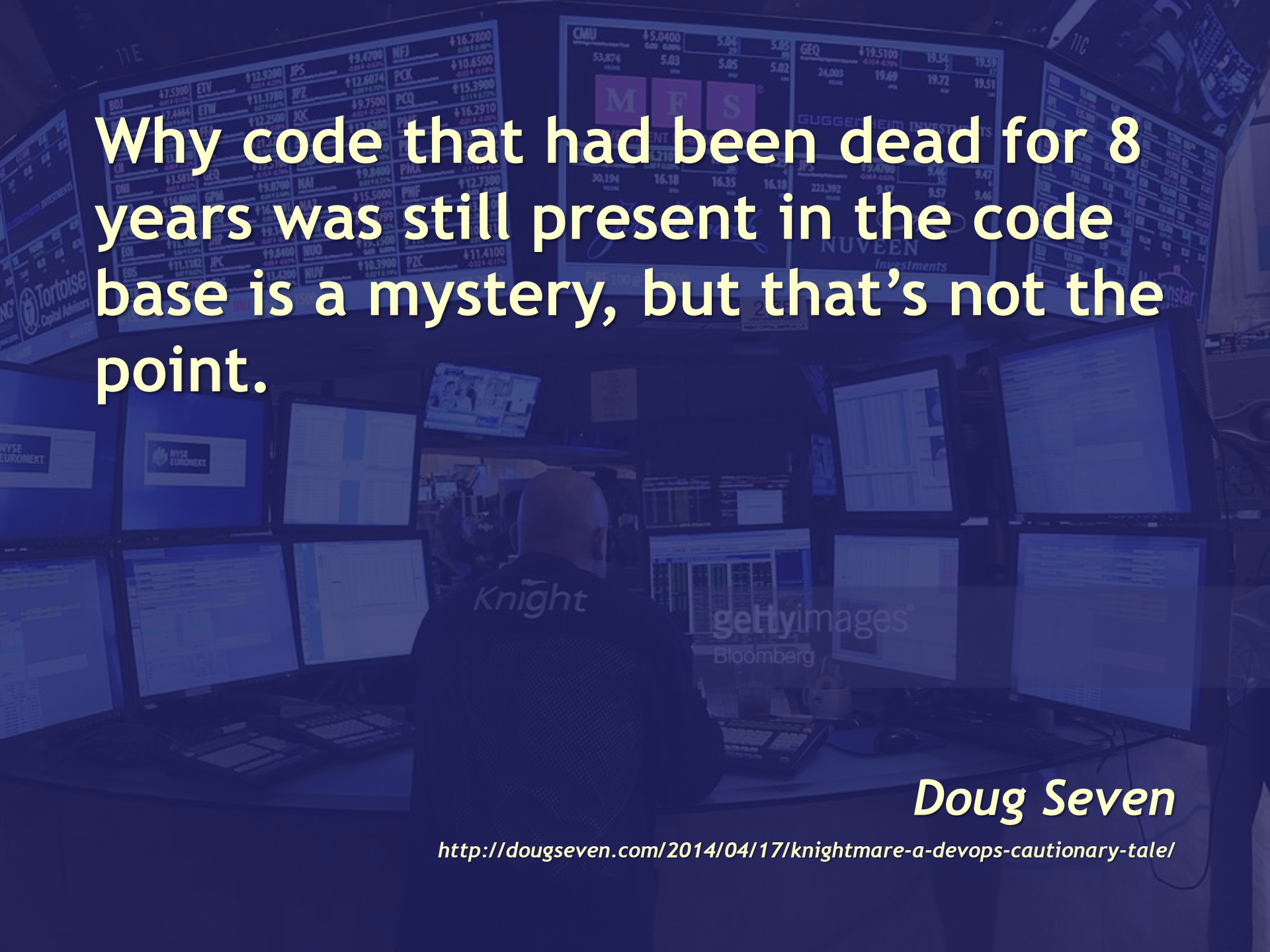
A person wearing a dark shirt with the "Knight" logo on the back is seated at a desk in a trading floor. The desk is cluttered with multiple computer monitors. The background is filled with more monitors displaying various financial data, including stock prices and market indices. The overall scene is dimly lit with a blue tint.

The update to SMARS was intended to replace old, unused code referred to as “Power Peg” — functionality that Knight hadn’t used in 8-years.

*Doug Seven*

<http://dougseven.com/2014/04/17/knightmare-a-devops-cautionary-tale/>

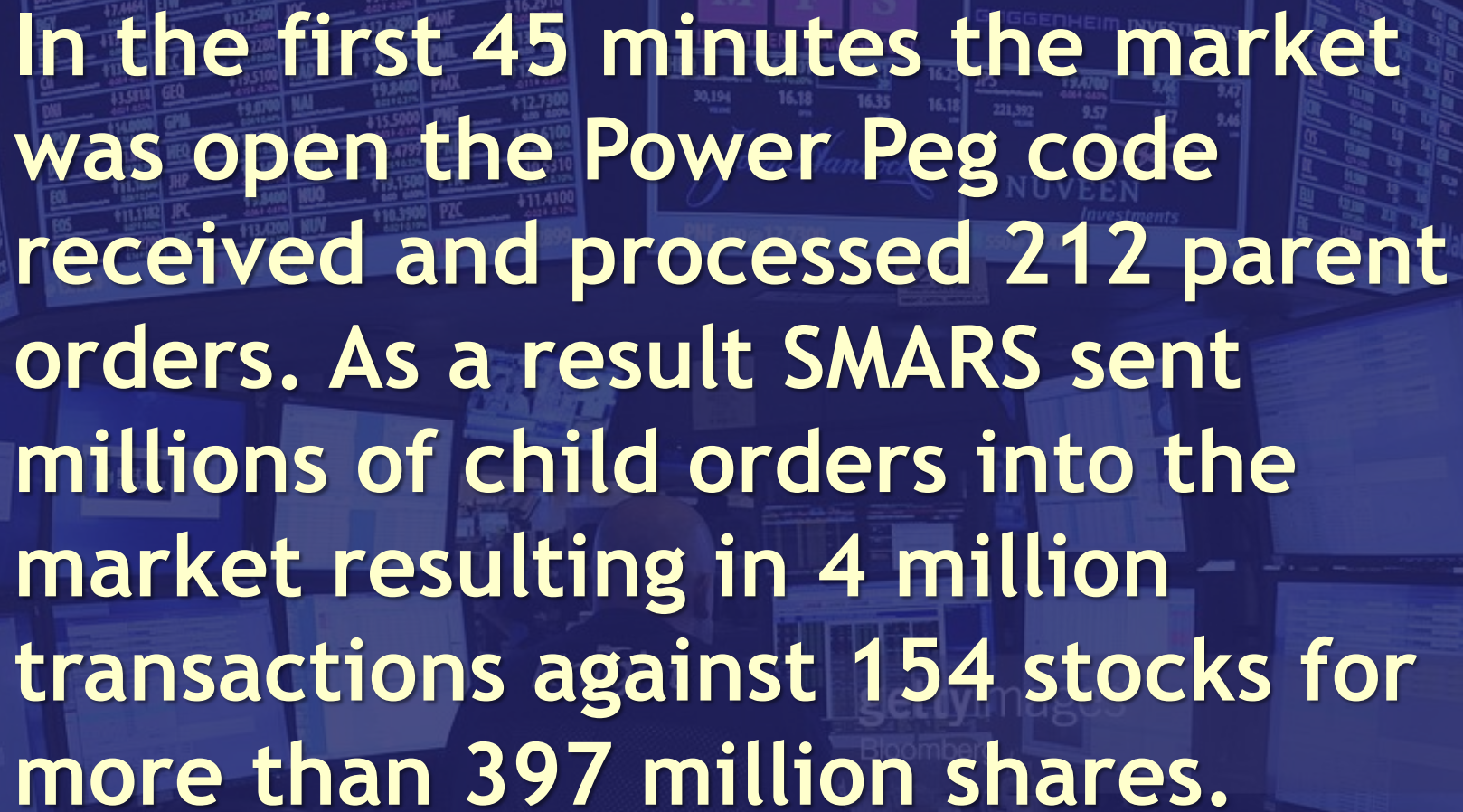


A person is seen from behind, sitting at a desk in a trading floor. They are wearing a dark shirt with "Knight" written on the back. The desk is filled with multiple computer monitors. The background wall is covered with large digital displays showing financial data, including stock prices and market indices. The overall scene is dimly lit with a blue tint.

Why code that had been dead for 8 years was still present in the code base is a mystery, but that's not the point.

***Doug Seven***

<http://dougseven.com/2014/04/17/knightmare-a-devops-cautionary-tale/>

The background image shows a person from behind, sitting at a desk in a trading floor. They are looking at several computer monitors. The screens display various financial data, including stock prices, market indices, and company logos like 'Tortoise Capital Advisors' and 'Gigamon Investments'. The overall scene is dimly lit with a blue tint, emphasizing the technical and financial nature of the environment.

In the first 45 minutes the market was open the Power Peg code received and processed 212 parent orders. As a result SMARS sent millions of child orders into the market resulting in 4 million transactions against 154 stocks for more than 397 million shares.

*Doug Seven*

<http://dougseven.com/2014/04/17/knightmare-a-devops-cautionary-tale/>

Our task is not to find the maximum amount of content in a work of art.

Our task is to cut back content so that we can see the thing at all.

Susan Sontag





**Kevlin Henney**

@KevlinHenney



We keep talking about incremental development; we don't talk enough about decremental development.

11:39 AM - 28 Nov 2014

**10** RETWEETS **4** FAVORITES



<https://twitter.com/KevlinHenney/status/538296211166740480>

ABACUS

E.F. Schumacher

Small  
Is Beautiful

There is wisdom in smallness if only  
on account of the smallness and  
patchiness of human knowledge,  
which relies on experiment far more  
than on understanding.

A STUDY OF ECONOMICS  
AS IF PEOPLE MATTERED