

## Being an Engineering Consultant: What Does It Take?

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See <<http://www.hasys.com/tutorials.html>> for charts

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## Consulting Presents You with a Wide Variety of Projects



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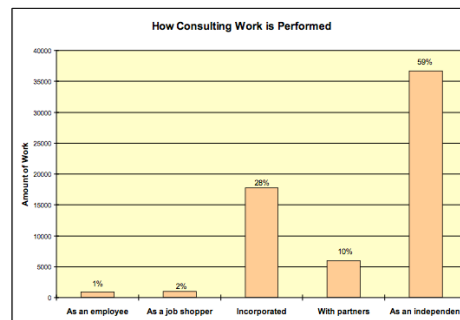
## Consulting Has Disadvantages as Well as Advantages

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|---|---|
| <p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Potential for Higher Income</li> <li>• Independence</li> <li>• Creative Freedom</li> <li>• Pride in Accomplishment</li> <li>• Freedom from Employment Antiperks             <ul style="list-style-type: none"> <li>– Performance Reviews</li> <li>– “Ethics” Training</li> <li>– Other Corporate Indoctrination</li> </ul> </li> <li>• Control Retirement with SEP-IRAs</li> <li>• No Collective Bargaining Agreement Career Constraints</li> </ul> | <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Risk</li> <li>• Uncertain Income</li> <li>• Responsibility</li> <li>• Effort</li> <li>• Investment</li> <li>• Lack of Flexibility</li> <li>• No Employment Perks             <ul style="list-style-type: none"> <li>– Paid Time Off</li> <li>– Insurance</li> <li>– Retirement Plan</li> </ul> </li> </ul> |
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## Most Consultants Operate as Independent Contractors

- Independent Means:
  - Meet a Preponderance of the IRS 20 Factors
  - Otherwise IRS Can Find You Are a “Statutory Employee”
  - Very Bad if They Do
  
- Note: Rates for Job Shops Significantly Lower
  - Model is Salary Plus Cash in Place of Some Benefits
  - About 25% to 35% over Salary
  - Preferred by Large Corporations, but Controlled by Single Client



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Section 1706 General Rule: Client has the right to control or direct only the result of the work of an independent contractor and not the means and methods used by the contractor to accomplish the result.

The 20 Common Law Factors

- |  |   |
|--|---|
| 1. No instructions                               | 11. No interim reports                    |
| 2. No training                                   | 12. Paid by job                           |
| 3. Work is not essential to client               | 13. Pays own expenses                     |
| 4. Services don't have to be rendered personally | 14. Own tools and materials               |
| 5. Control own assistants                        | 15. Significant investment                |
| 6. Not a continuing relationship                 | 16. Possible profit or loss               |
| 7. Own work hours                                | 17. Working for multiple firms            |
| 8. Choose clients                                | 18. Offers services to the general public |
| 9. Control job location                          | 19. Limited right to discharge            |
| 10. Controls work order                          | 20. Limited right to quit                 |

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## Our Starting Vision Initially Failed Initially, but Has Worked Later with Start-ups

*Provide Systems Engineering to Small Companies*

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Small Businesses (&lt; 500)             <ul style="list-style-type: none"> <li>– Turn Around Too Short</li> <li>– Don't Like Consultants</li> <li>– Only Want Tangible Well-Defined Services</li> <li>– Prefer Fixed Price Contracts</li> </ul> </li> <li>• Short Courses             <ul style="list-style-type: none"> <li>– Does Not Pay Well</li> <li>– Huge Overhead in Preparing a Good Class</li> </ul> </li> <li>• Web Software             <ul style="list-style-type: none"> <li>– .COM Crash</li> <li>– Outsourcing to India</li> <li>– Application Servers</li> <li>– No Longer Pays Well</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Mid Size Companies Look Good             <ul style="list-style-type: none"> <li>– Large Enough to Afford Outside Consulting</li> <li>– Nimble Enough to Take Advantage of Consultants</li> <li>– Generally Requires Knowing Some One</li> <li>– Trial Contracts Too Short to Provide Value</li> </ul> </li> <li>• Defense Contractors Bad Now             <ul style="list-style-type: none"> <li>– 500 B\$ Cuts over 10 years</li> </ul> </li> <li>• Start-ups Appear Hot Now             <ul style="list-style-type: none"> <li>– New President Next Year</li> <li>– Better Economy</li> <li>– Want to be in Market then</li> </ul> </li> </ul> |
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## Early Career Steps Support Later Consulting Practice

- Find a Niche
  - Focus on becoming an Expert
  - Long term goal: Be an Authority
- Seek out Technical Breadth
- Get 5-10 years of experience
- Get your Professional Engineering (PE) License
- Consider Advanced Degree
- IEEE
  - Join
  - Advance to Senior Member
  - Perhaps go for Fellow
- Tangible Niche Skills Easier to Sell
  - Reliability Analysis
  - Network Set-up/Management
  - Microwave Filter Design
  - Windows C++
  - etc.
- Specific Domain Knowledge is Critical
  - Not Just Radar: Airborne Synthetic Aperture Radar
  - Not Just Digital Control: Digital PWM Control of Flyback Power Converters
  - Not just embedded software: Texas Instruments MSP430 Developer Network

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## Personal Choices

- Success Takes Longer than You Think
  - Save “Quitting Money” (Start-up Funds)
  - Live below your means
- Need Business Continuation Funds
  - Uneven Income
  - Almost 1/5 of our 17 years has been income gap
  - Currently Between Clients
- Personality of Consultant
  - Self-Starter
  - Like Other People
  - Leadership Ability
  - Responsible
  - Organized
  - Hard Worker
  - Decisive
  - Trustworthy
  - Persistent
  - Healthy
  - Energetic

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## Transition

- Have a Salable Skill
- Have Experience
- Have Sufficient Financial Reserves to Survive Start-up
- Have the Personality to Succeed
- Willing to Take the Risk
- And ... Have an Exit Plan (When to Accept Failure and Quit)
- Look Like a Business
  - Real Business Cards
  - Separate Phone Lines
  - Good Computers, Software Tools, and Internet Access
- Act Like a Business
  - IRS Section 1706 Common Law Factors
  - City Business License
  - Consider General and Professional Liability Insurance
- **Warning:** Pretending is More Fun than Succeeding

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## The Fundamental Cycle of Consulting

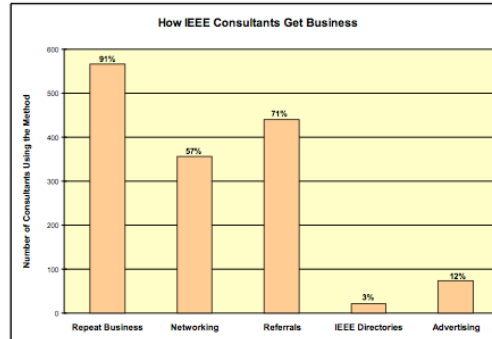
- A. Get Clients
- B. Perform on Contracts
- C. Go To Step A

Repeat Business is the Consultant's Bread and Butter

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## Most Clients Come From People You Know

1. Clients You Know
  - Previous Clients
  - Former Colleagues
  - Volunteer Activities
  - Number 1 Path to Engagements
2. Referrals from Fellow Consultants
  - Distant Second
3. Referral Mechanisms
  - Directories
  - Referral Lines
  - etc.
  - Even More Distant Third

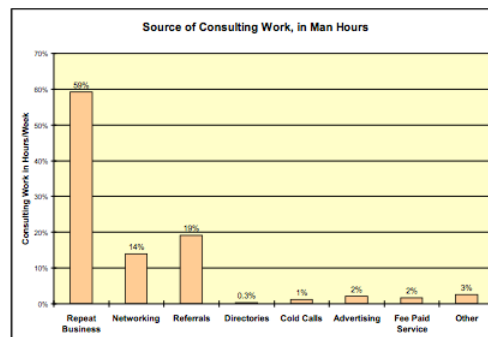


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## Who You Know is the Most Important: Repeat Business is The Consultant's Bread and Butter

Referrals for Assignments From:

- Repeat Clients
- Former Coworker
  - I introduced him to his wife
  - He brought me into a series of contracts worth over 2 M\$
  - Repeat Client "Sort of"
- Client Referrals
- IEEE Colleague
  - Found me in Consultants Directory
  - Already knew me from IEEE
- Volunteer Work
- No Cold Contracts Ever



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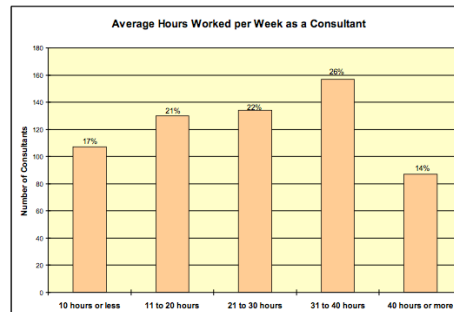
## Networking Is Exchanging Info to Build Relationships and Help Each Other

- Three Key Steps
  - Find Common Interests
  - Participate in 3 Organizations
  - Act like a Host at Gatherings
- Where to Go
  - IEEE Meetings
  - Alumni Groups
  - Political Organizations
  - Charitable/Religious Organizations
- Develop a Talk and Give it at a Meeting

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## Pricing Models and Surveys Help You Set Your Fee

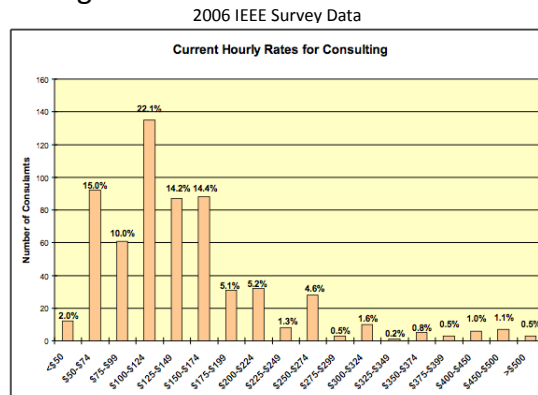
- Simple Model
  - 2 to 3 times Desired/Last Salary
  - Adjust Based on Salary Survey Data
  - Approximation of Business Cost Model
- Value Model (18% Bill This Way)
  - Fixed Price
  - Based on Value to Client, Not Hours of Work
  - Hard to Do
- Business Cost Model
  - Total Annual Costs over Annual Billable Hours
  - Costs Include:
    - Time Off and Benefits (including Employers part of FICA)
    - Overhead Time and Expenses
  - Complicated to compute



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## Summary of Fee Surveys for Independent Consultants

- Average Rate: \$125/billable hour (2006 data)
  - Extrapolated to 2012: \$170
- Rates Tend to be Above Average for:
  - P.E.
  - Advanced Degree
  - Expert Witness
  - High Demand Specialties



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