INTRODUCTION

We believe it will be worth your while to complete this Research, Development, & Engineering [RD&E] survey covering the full range of Product Development and to request a copy of the results that will be sent to all survey participants who make an honest effort to complete this survey questionnaire.

The participants in our Biennial Survey receive a forty-plus page results document complete with graphics. Our 1998 and 2000 participants were completely satisfied with the document they received and sent us only accolades for our research work. We will again provide the results to those who credibly complete responses to all questions within our required timeframes. We appreciate your commitment of time and rigorousness in the completion of this survey. We will absolutely keep responses confidential!

COMPLETED SURVEYS ARE DUE BY August 12, 2002. THANK YOU!

A special thank you to the numerous 1998 and 2000 survey participants who emailed GGI after our recent RapidNews announcement and expressed their interest in participating in the 2002 survey. Thank you! GGI will do high quality work this time too!

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This survey covers five areas relating to Capacity Management Practices where there is currently significant industry activity. The sixth section, the first section of the survey, allows us to categorize your response. The results of this survey will be of significant interest to managers and decision makers.

SECTION A RESPONDENT PROFILE

The purpose of this section is to correctly categorize your company within the population of companies that respond to this survey. Persons who wish to compare their response to the overall results, usually want to do so with other companies of similar size and type. We are trying to achieve the end result that most people seek. Please do your best to characterize your response. The format for Section A is the exact same format as the 1998 and 2000 GGI surveys which were well received.

This is the address to which the survey results will be mailed.

A1. Person completing survey: Name: _____
Title: _____
Company Name: _____
Address: _____
_____

Phone: _____Fax:_____ E-Mail: _____

Would you like a copy of the survey results? ☐ Yes or ☐ No

A2. Is this a ☐ public or ☐ private company?

A3. For what type/scope of company or organization will you be responding to the questions in this survey? [Check One That Best Applies]

- ☐ Parent Corporation [A P/L Unit]
- ☐ Strategic Business Unit/HQ [A P/L Unit]
- ☐ Division/Business Unit/Grp [A P/L Unit]
- ☐ Functional Org/Dept. [Cost Center]
- ☐ Manufacturing Plant [Cost Center]
- ☐ Other: _____

A4. Identify your company's industry or service: [Check One That Best Applies]

☐ Aerospace	☐ Defense	☐ Medical Products
☐ Automotive	☐ Durable goods	☐ Metals
☐ Chemical	☐ Education	☐ Oil/Gas
☐ College/Univ. R&D	☐ Electronics	☐ Pharmaceuticals
☐ Communications	☐ Engineering/Contract Design	☐ Research/Nat'l Labs
☐ Computers	☐ Food	☐ Semiconductors
☐ Construction	☐ Heavy Machinery	☐ Telecomm. Products
☐ Consulting/Services	☐ Industrial products	☐ Textiles
☐ Consumer Products	☐ Materials	☐ Other Ind._____
☐ Software-Web	☐ Software-Digital	☐ Software-Embedded
☐ Consulting	☐ Market Research	☐ Financial Services
☐ Government	☐ Utility	☐ Other Svc._____

A5. Sales revenue over your last full year: [Check One That Best Applies]

☐ <$25M ☐ $25-100M ☐ $100-250M ☐ $250-500M ☐ $500M-1B
☐ $1-5B ☐ >$5B

A6. Number of full-time employees: [Check One That Best Applies]

☐ 1-500 ☐ 500-1000 ☐ 1000-5000 ☐ 5000-10,000
☐ 10,000-25,000 ☐ 25,000-50,000 ☐ 50,000+

A7. Please indicate the types of manufacturing operations covered by the metrics discussed in this survey: [Check All That Apply]

☐ Process Mfg ☐ Repetitive Mfg ☐ Discrete Mfg ☐ Job Shop/Customized Mfg

A8. Places your company does business: [Check All That Apply]

	North America	Europe	Asia	Rest of World
Sales	☐	☐	☐	☐
R&D	☐	☐	☐	☐
Mfg	☐	☐	☐	☐

A9. What function do you personally perform in the company? [Check One That Best Applies]

☐ Mgt ☐ Sales ☐ Mktg ☐ R&D/Eng ☐ Mfg-Production ☐ Mfg-Purchasing/Materials
☐ Quality ☐ Environ./Safety/Regulatory ☐ Finance ☐ Information Systems ☐ HR

SECTION B LOADING THE RD&E CAPACITY PIPELINE

B1. Selection Process: How many times does your company review a given idea/concept/definition/proposal before finally making a business decision to either formally approve or formally reject a proposed RD&E product and/or investment project. [Check One Box Only]

☐ a. 2.5-Step — First a simple short, probably one-page, description of the idea is discussed. Little work has been performed, if any. The idea is in a highly raw state. At this time, it is either killed, tabled, or moved forward for further analysis.

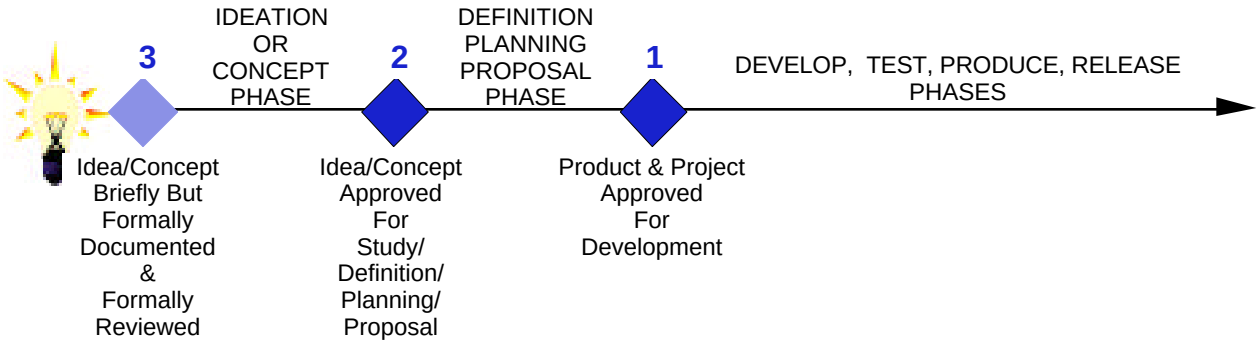
☐ b. 2- Step — First a preliminary marketing and technical analysis is reviewed. At this time, it is either killed, tabled, or moved forward for final estimation.

☐ c. 1- Step — A single top management meeting is held for a go/no go decision. A complete comprehensive plan/analysis has been prepared for consideration. Work leading up to this meeting has been conducted in functional organizations.

☐ d. No-Step — One person/organization determines the R&D products/projects to be done. Or, somehow it happens without any perceiveable process. There is no cross-functional multi-disciplined management team that decides.

☐ e. Other _____

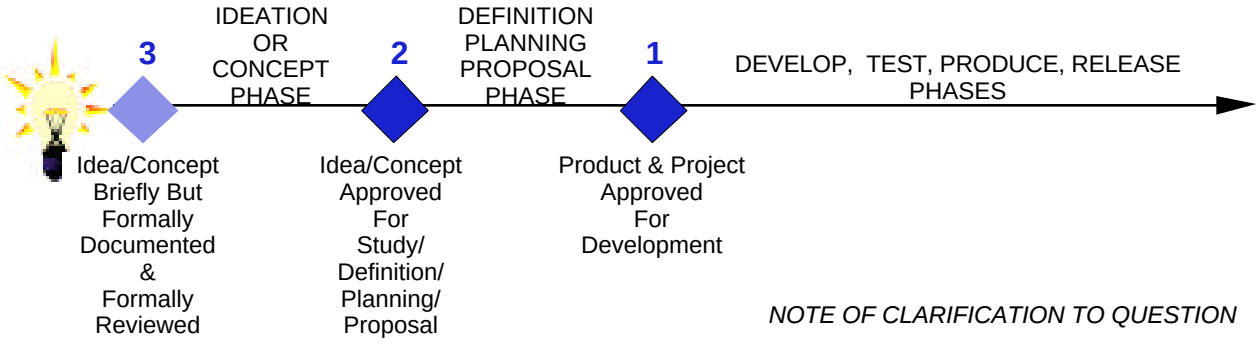
B2. Selection Process Decisionmakers & Decisionmaking: How many people are involved in the selection process you referred to in your response to Question B1 above? Limit your response to include the actual decisionmakers only, not everyone consulted during the process. [If you have a "No-Step" or "1-Step Process," fill out only "Column 2" in the box below. If you have a "2-Step or 2.5 Step Process," fill out "Columns 1 and 2."]



	COLUMN 1	COLUMN 2
Number of People Making The Decision		
The Decision Process is best described as.		
Formal Meeting		
Informal Meeting		
Somehow Happens		
Solo Effort		
Unknown		

B3. Pipeline Loading & Decisionmaking: This question measures "throughput and yield rate" of product selection decisions made during a one-year period. Does your company approve every product/project presented, or do some products/projects not get approved? [If you have a "No-Step" or "1-Step Process," fill out only "Column 2" in the box below. If you have a "2-Step or 2.5 Step Process," fill out "Columns 1 and 2."]

My Company Does Not Perform Any Of The Metrics/Activities Listed Below ☐



	COLUMN 1	COLUMN 2
# Approved		
# On Hold		
# Rejected		
# Died Mid-Phase		
TOTAL REVIEWED		

NOTE OF CLARIFICATION TO QUESTION

Often, in many companies, the specific cycle for "Capital Approval" is separated from the actual company decision to approve a Project/Product for development. Many companies wait until prototypes are built to formally approve the capital for the project. Ignore this type of a "subsequent capital process. " The question here pertains to "Product/Project Approval," not Capital Approval [unless it occurs simultaneously].

B4. Selecting Research or Advanced Development Projects: Does RD&E use the same methods you referred to in questions B1, B2, and B3 above to select advanced Research and Advanced Development projects? a. Yes ☐ No ☐

b. If No, is the R&AD process more formal or informal? Formal ☐ Informal ☐

B5. Projects & Products In Backlog: In your answer to this question, do not include Sustaining Engineering or Cost Reduction projects unless these projects result in new products that will totally replace and/or be sold in competition with the old product. This question is about projects in the backlog that result in new products.

a. What is the "average number of projects in the R&D backlog at any point in time?" Number

b. About how many "saleable end-item products (not spare parts)" does this represent? Number

B6. Projects & Products Released Each Year: In your answer to this question, do not include Sustaining Engineering or Cost Reduction projects unless these projects result in new products that will totally replace and/or be sold in competition with the old product. This question is about projects completed that result in new products, not total projects completed.

a. What is the "average number of projects completed each year?" Number

b. About how many "saleable end-item products (not spare parts)" does this represent? Number

SECTION C PROVIDING CAPACITY FOR RD&E ACTIVITIES

C1. Outside/Contract/Temporary Labor/Services: Does RD&E utilize outside contractors, engineering or laboratory analysis services, engineering prototyping services, process piloting services, industrial design services, packaging design services, drafting, contract programmers, and other outside services? a. Yes ☐ No ☐

bc. If Yes, what % of total capacity is outsourced each year across all services? [Please check one box for Average. Please check two boxes for the Range experienced over good and poor economic environments.]

	Average	Range		Average	Range
Less Than 10%	☐	☐☐	26% - 30%	☐	☐☐
11% - 15%	☐	☐☐	31% - 40%	☐	☐☐
16% - 20%	☐	☐☐	41% - 50%	☐	☐☐
20% - 25%	☐	☐☐	51% - 100%	☐	☐☐

d. If Yes, what % of all Outside resources perform Sustaining Engineering? ____ %

C2. Allocating Resources To Sustaining Activities: What method does RD&E use to determine the number of resources to allocate to sustaining engineering activities to support products previously/already released for sale? [Check one box for each practice that exists in your company. Check both boxes for the single most common practice.]

☐☐ a. Sustaining engineering, spare parts, service is a profitable revenue producing business. We organize resources around these activities.

☐☐ b. Almost everyone is involved. Product support takes what it takes.

☐☐ c. Almost everyone is involved. Sustaining engineering needs are reviewed periodically. Resources are targeted to these activities/projects, equally prioritized to new products.

☐☐ d. Almost everyone is involved. Sustaining engineering needs are reviewed periodically. Resources are targeted to these activities/projects, but new products take priority.

☐☐ e. Resources are clearly divided into development and sustaining groups within RD&E. Sustaining activities are performed at significant level outside the sustaining group.

☐☐ f. Resources are clearly divided into development and sustaining groups within RD&E. Sustaining engineering work remains contained within the sustaining group.

☐☐ g. The company does not sustain products. We outsource sustaining engineering.

☐☐ h. The company does not sustain products after initial bug fixes. We replace them.

☐☐ i. Other: Write In (Optional): _____

_____

SECTION D BALANCING CROSS-FUNCTIONAL RESOURCES

Preface to SECTION D: The information requested in this section is necessary to calculate staffing ratios within RD&E and across Cross-Functional Organizations. The questions in this section are designed to remove the burden of calculation from respondents. We are requesting the raw data. While the questions calculate "% of Time New Prod" and "% Sustaining" which is useful unto itself, the purpose is to get at the staffing ratios. Question D1 and D2 must include the raw headcount data in order to compute the Staffing Ratios. Neither the "Internal To RD&E Staffing Ratios" nor the "Cross-Functional To RD&E Staffing Ratios" can be derived without the raw headcount estimates. GGI will not sample the survey population in such a way that individual company responses become determinable.

Instructions to SECTION D: Include outside contractor labor that supplements internal development staff, but not permanently outsourced/purchased activities. Use best estimates for all questions. There is almost no such thing as an "exact" answer for % Time New Prod vs. % Time Sustain Prod. If you normalize the response, treat D1 and D2 as a whole.

D1. RD&E Ratios: For decades, corporate managers have estimated staffing requirements in certain functions using ratios. In mechanical engineering, for example, a popular ratio is the number of draftpersons to the number of engineers. In software development, for example, a popular ratio is the number of developers to the number of V&V/SQA testers. The purpose of this question is to determine average industry staffing ratios between functions involved in RD&E/Product Development.

LIST OF FUNCTIONAL DEPARTMENT NAMES TYPICAL IN INDUSTRIAL, HIGH-TECH, PHARMA/BIOTECH COMPANIES RESEARCH, DEVELOPMENT, ENGINEERING, & PRODUCT DEVELOPMENT RESOURCES	TOTAL PEOPLE IN FCN	% TIME NEW PROD	% TIME SUSTAIN PROD
Top Management/Staff & Management Not Included In Section Below		%	%
Basic Research, Applied Research, Advanced Development		%	%
		%	%
Development including Biology, Microbiology, & Life Sciences		%	%
Development including Chemistry, & Material Sciences		%	%
Development including Physics, Applied Mathematics, & Mathematics		%	%
Write In:		%	%
Write In:		%	%
H/W Design Engineering including Architects and Principal Engineers		%	%
H/W Design Technicians		%	%
H/W Design Draftpersons		%	%
H/W Test Engineering not including Production Test Engineering		%	%
H/W Test Technicians not including Production Test Technicians		%	%
H/W Test Draftpersons not including Production Test Draftpersons		%	%
Write In:		%	%
Write In:		%	%
S/W Architecture, System Design & Development Engineering		%	%
S/W Programmers		%	%
S/W Test including V&V, SQA, …		%	%
Write In:		%	%
Write In:		%	%
RD&E Admin: Formulations & BOMs, Change Process		%	%
RD&E Admin: Systems including LIMS, CAD, CAE, S/W Tools		%	%
RD&E Admin: Program/Project Management, Finance, Accounting		%	%
Write In:		%	%
All Other RD&E not included in above categories.		%	%
TOTAL / AVERAGE / AVERAGE		%	%

D2. Cross Functional Ratios: In the early 1990s, in three separate studies, industry-wide surveys were conducted that estimated staffing levels between RD&E and cross-functional organizations that support product development. The purpose of this question is to determine average industry staffing ratios between functions involved in RD&E/Product Development in 2002, and whether those ratios have changed during the past decade.

LIST OF FUNCTIONAL DEPARTMENT NAMES TYPICAL IN INDUSTRIAL, HIGH-TECH, PHARMA/BIOTECH COMPANIES	TOTAL PEOPLE IN FCN	% TIME NEW PROD	% TIME SUSTAIN PROD
CROSS-FUNCTIONAL RESOURCES IN FUNCTIONS DIRECTLY SUPPORTING NEW PRODUCT DEVELOPMENT & SUSTAINING			
Strategic Marketing		%	N/A
Product Marketing & Management		%	%
Write In:		%	%
Write In:		%	%
		%	%
Purchasing		%	%
Manufacturing Engineering		%	%
Process Engineering including Facilities Eng. for process companies		%	%
Quality including Reliability Engineering, QA, QC, …		%	%
Production Test including Production & Production Test Engineering		%	%
		%	%
Write In:		%	%
Write In:		%	%
Write In:		%	%
All Other RD&E not included in above categories.		%	%
TOTAL / AVERAGE / AVERAGE		**%**	**%**

SECTION E USING SYSTEMS, TOOLS, & METRICS TO MANAGE CAPACITY

E1. Frequency Of Capacity Planning & Analysis: What periodic interval best describes the visibility of metrics and metrics reporting at the top level of the product development organization? [Check One Box Only]

- ☐ Continuous, I sleep with capacity.
- ☐ Daily
- ☐ Weekly
- ☐ Monthly
- ☐ Quarterly
- ☐ Semi-Annual
- ☐ Annual
- ☐ Every 2-3 years, then it dies down.

E2. System Used For Capacity Planning & Analysis: What "technology" underlies the "capacity planning & analysis system" that your company uses for RD&E? Assume the terms "capacity" and "resource" can be used interchangeably when responding to this question. [Check One Box Only]

- ☐ Custom Developed Software Application, Soup To Nuts, By IS
- ☐ Custom Developed Software Application, Built on top of ERP System/DB, By IS
- ☐ Custom Developed Software Application, Built on top of Multi-Project System, By IS
- ☐ Custom Developed Software Application, Soup To Nuts, By ENG.
- ☐ Custom Developed Software Application, Built on top of Multi-Project System, By ENG.

- ☐ Multi-Project Project Management System, Provided By Supplier Of The ERP System
  - Baan, SAP, Peoplesoft, etc …
- ☐ Multi-Project Project Management System, Provided By Supplier Of Specialty Software
  - Artemis, etc …
- ☐ Multi-Project Project Management System, Provided By Supplier Of PM Software
  - Primavera, Scitor, etc …
- ☐ Multi-Purpose Process Management System, Provided By Supplier Of Specialty Software
  - IDE, Sopheon, Value Innovations, etc …

- ☐ Single-User MS Project-Type Software, Integrated Common DB Via Packaged Software
- ☐ Single-User MS Project-Type Software, Integrated Common DB Via Custom Software
- ☐ Single-User MS Project-Type Software, Integrated Common DB Via Custom Spreadsheet
- ☐ Single-User MS Project-Type Software, Integrated Common DB Via Consultant Spreadsheet
- ☐ Single-User MS Project-Type Software, Assembled Common DB Via Presentations
- ☐ Spreadsheet-Based Capacity Planning & Analysis, No Underlying Project System(s)

- ☐ No Project Management System/Software, Presentations Only
- ☐ No Project Management System/Software, Judgement Only
- ☐ Capacity Management, Are You Kidding, In Your Dreams, Everyone Is Baffled

E3. Optimization Capability Of System Used For Capacity Planning & Analysis: Using the "system" referred to in your response to E2, please categorize the optimization capability per the description below. [Check One Box Only]

- ☐ Capacity Planning – Optimizes project backlog within capacity over multiple time periods
- ☐ Resource Planning – Assembles project backlog into an aggregate total of resources needed
- ☐ Don't know

E4. Abstractions Used For Capacity Planning & Analysis: Which of the abstractions below does your company actively use when planning projects and resources "at a high level?" Please indicate any individual elements of a Model that closely align with the terms for the elements that your company uses. [Check One Abstraction Method Only, Then Sub-Elements If They Apply]

☐ a. Architectural Model		☐ b. Size Model		☐ c. No Abstractions
Platform	☐	Large Project/Program	☐	Each Project's
Major Derivative	☐	Medium Project	☐	Data Is Used
Derivative	☐	Small Project	☐	
Extension	☐	Cost Reduction Project	☐	☐ d. Judgement
Sustaining	☐	Sustaining	☐	

E5. Capacity Management Measurement Priority: How many metrics are in the set of metrics that are used by R&D Officers to measure and/or steer RD&E as a whole? This question pertains solely to RD&E and related product development activities.

a. RD&E *does have* a clearly defined "set of metrics" that is known by most R&D managers.

The number of metrics in the set is [Number] .

b. RD&E *does not have* a clearly defined set, but the number can be derived.

I have derived/estimated an answer by adding up the number of metrics reported by staff members at company meetings. Therefore, the number of metrics in the company-wide "set of metrics" determined by way of my calculation for the purpose of completing this survey is:

Ten or Less Metrics	☐	101-125 Metrics	☐
11 - 25 Metrics	☐	126-150 Metrics	☐
26- 50 Metrics	☐	150-175 Metrics	☐
51- 75 Metrics	☐	176-200 Metrics	☐
76-100 Metrics	☐	Greater Than 200 Metrics	☐

c. ☐ RD&E *does not have* a clearly defined set, and the number *cannot* be derived.

d. If you answered either “a” or “b” above, what is the number of capacity management metrics that are part of the “set”.

The number of metrics in the set is [Number] .

SECTION F RD&E METRICS USED IN INDUSTRY

Section F consists of one single question. GGI asked this question in both the 1998 and 2000 surveys. The results jumped off the page. It turned out that there are very few metrics that are commonly and widely used by R&D organizations. Nearly identical responses appeared both times. The results of this 2002 survey will be contrasted to the 1998 and 2000 findings so first time participants in the 2002 survey will get the benefits of all three surveys. Survey participants wishing more information should refer to the February 2000 issue of CFO Magazine published by The Economist.

F1. Which of the following R&D metrics are "in use" at your company?: To qualify as “in use,” these metrics should: (1) be measured at least on an annual basis; (2) be visible to *all* members of the top management group as active ongoing tools; (3) be stored in a manner that numerous people in the organization could find them easily; and (4) have some reliability in that the method used to calculate them is consistent from year to year. Please be strict in applying this definition of “in use” when responding to the measures listed for your consideration below. [Check All That Apply]

Productivity Of Capacity Measures

ROI - Return On Innovation [Calculated using any method/procedure.]	☐
Write-In/Consultant Developed _____	☐
Write-In/Home Grown _____	☐
Write-In/Other _____	☐

Productivity Of Capacity Measures – continued.

- ☐ Average sales per engineer or developer or scientist
- ☐ Average profits per engineer or developer or scientist

- ☐ Average products produced per engineer or developer or scientist
- ☐ Average parts produced per engineer or developer or scientist
- ☐ Average drawings produced per engineer or developer or scientist
- ☐ Average lines of code produced per engineer or developer or scientist

- ☐ Average new products released per engineer or developer or scientist
- ☐ Average new product sales per engineer or developer or scientist
- ☐ Average new product profits per engineer or developer or scientist

- ☐ Average number prototypes built per new product
- ☐ % First pass design success

Aggregate Capacity Measures

- ☐ R&D capacity plan target level
- ☐ % Over/under R&D capacity plan target level

- ☐ % Increase/decrease in R&D headcount
- ☐ % Resources/investment dedicated to new product development
- ☐ % Resources/investment dedicated to sustaining existing products

Staffing Ratios:
- ☐ Internal-To-Engineering staffing ratios
- ☐ Cross-Functional staffing ratios

- ☐ Average # factory products supported per engineer or developer or scientist
- ☐ Average # active projects/ products per engineer or developer or scientist

Throughput Of Capacity Measures [Assumes "Per Time Period," Usually Per Quarter or Year]

- ☐ # of idea/concept screened/reviewed
  - ☐ % of ideas/concepts accepted/rejected
- ☐ # of products in definition/planning/estimation stages
  - ☐ % of defined products/projects accepted/rejected
- ☐ # of products/projects approved but not started [inactive backlog]
- ☐ # of products/projects in active development [active backlog]
- ☐ # of products released
- ☐ # of products actively supported/sustained
- ☐ # of products retired/obsoleted

Revenue From Capacity Measures

- ☐ Current-year % sales due to new products released in the past N-years

If used, what is N = [Number] year(s) (i.e., past 1, 2, 3, 4, 5 years)

Revenue From Capacity Measures – continued.

- ☐ Current-year % sales due to total Non Recurring Engineering Billings
- ☐ Current-year % sales due to total technology licensing
- ☐ Current-year % sales due to total royalty income
- ☐ First-Year Sales of new products
- ☐ First Two Years of Sales of new products
- ☐ First Three Years of Sales of new products
- ☐ First Four Years of Sales of new products
- ☐ First Five Years of Sales of new products

Profit From Capacity Measures

- ☐ Current-year % profits due to new products released in the past N-years

  If used, what is N = [Number] year(s) (i.e., past 1, 2, 3, 4, 5 years)

- ☐ Current-year % profits due to total Non Recurring Engineering Billings
- ☐ Current-year % profits due to total technology licensing
- ☐ Current-year % profits due to total royalty income
- ☐ First-Year Profits of new products
- ☐ First Two Years of Profits of new products
- ☐ First Three Years of Profits of new products
- ☐ First Four Years of Profits of new products
- ☐ First Five Years of Profits of new products

Intellectual Property Generated From Capacity Measures

- ☐ Total patents filed/pending/awarded
- ☐ Average patents per development professional

- ☐ Total industry standards planned/pending/achieved
- ☐ Total licenses granted and/or acquired
- ☐ Total value of licenses granted and/or acquired

- ☐ Total grants received
- ☐ Total value of grant revenues received

Investment To Provide Capacity Measures

- ☐ R&D spending as a % of sales [Managed As A Single Number]
  [Managed as a single number across the organization.]
- ☐ R&D spending as a % of sales
  [Research spending managed separate from Development spending.]
- ☐ R&D spending as a % of sales
  [Process R&D spending managed separate from R&D spending.]

- ☐ Average development cost per project/product
- ☐ Average capital cost per project/product

PLEASE RETURN SURVEY BY AUGUST 12, 2002

SEND BY US MAIL, UPS, FEDEX TO

Mr. Jonathan B. Gilmore
Manager, Research & Education Products
Goldense Group, Inc.
1346 South Street
Needham, MA 02492

781-444-5400 ext. 202

SEND BY EMAIL TO

jbg@goldensegroupinc.com

FAX IT TO US

781-444-5475

No cover page is necessary. Simply drop it in the fax machine. Your name and contact information is already on the first page of the questionnaire. Thank you.

IF YOU HAVE QUESTIONS OR NEED CLARIFICATION

Jon Gilmore

781-444-5400 ext. 202

!! THANK YOU FOR PARTICIPATING !!

IN THE
2002 PRODUCT DEVELOPMENT METRICS SURVEY

!! THANK YOU !!