

“I’m from KM, I’m here to help”

An adventure in best intentions

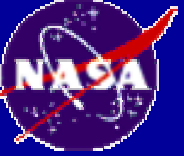
Presentation at the NASA Project Managers Forum

February 12, 2002

Lynne P. Cooper

Jet Propulsion Laboratory

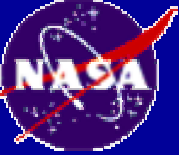
California Institute of Technology



The Technical Questions DB

Create a database of peer review questions for key laboratory technical disciplines

- Initiated in 1998 by upper management
- “Mind tickler” technical questions in disciplines applicable to flight projects
 - That could be asked during the design process or at a review
 - With the purpose of identifying and preventing problems
- Primary user: technical personnel working flight projects



Sample Question

Flight Software Question:

Do you have embedded test code in your flight sw?

If yes: Do you strip out the test code before final compile/delivery?

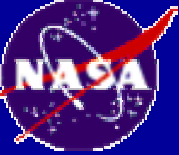
>If no: Can you inadvertently get into this code during flight?

>>If no: How can you be sure?

>>If yes: How does the code terminate?

Background:

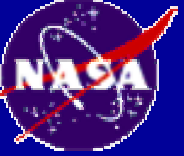
Accidental running of test code that terminated by turning off all power was the responsible for the loss of the Russian Phobos spacecraft.



Reality Check #1

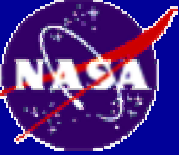
Pre-development discussion with cynical lunch-table crowd

- Desire Credible Sources:
 - **IF** the website contained questions from well-known (and respected) guru's such as ... **THEN** it would be really valuable and they would go there
- Afraid it will make more work:
 - Requirement push-up exercise: "you must go to the site & prepare a response to every question in there"
 - If there are too many "questions", then the effort to use it is greater than the potential benefit. ("If I have to scan 50 one-liners, I could do that -- but if there's hundreds of questions, that's too much")
 - Take a lot of effort would to determine if a question relevant



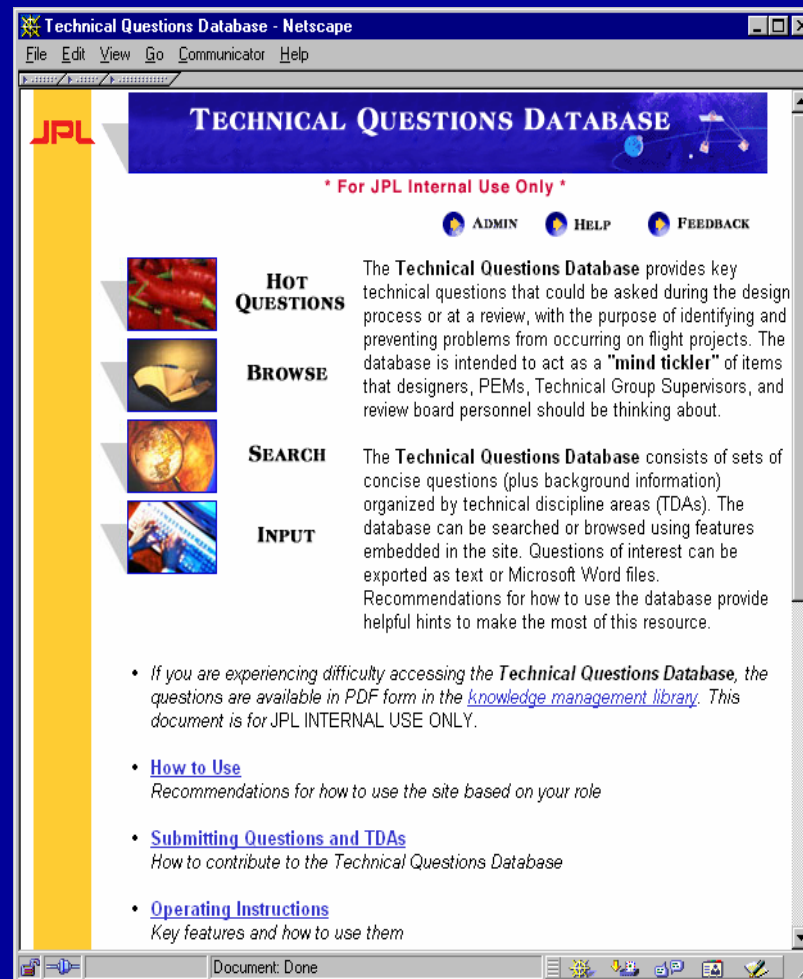
Reality Check #1 (cont)

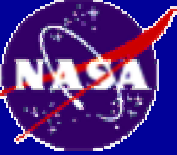
- System requirements
 - Search, filter, sort, select based on topics and categories
 - Interesting and useful
 - Anecdotal DB of what went wrong
- Review board needs to filter questions to id appropriate, relevant ones for this specific project and specific review.



Technical Questions DB

- Web-based system operational for internal JPL use
- 75 Technical Disciplines
- >700 Questions
- 20-50 users per month
- Low development cost
- Extremely low O&M





TQ DB Scenario



Technical Questions Database - Netscape
File Edit View Go Communicator Help

TECHNICAL QUESTION

** For JPL Internal U*

HOT QUESTIONS
The Technical Q... process or at a re... preventing proble... database is inten... that designers, P... review board pers...

BROWSE

SEARCH
The Technical Q... concise question... organized by tect... database can be... exported as text... Recommendation... helpful hints to m...

INPUT

- If you are experiencing difficulty accessing the questions are available in PDF form in the [known document](#) is for JPL INTERNAL USE ONLY.
- [How to Use](#)
Recommendations for how to use the site bas...
- [Submitting Questions and TDAs](#)
How to contribute to the Technical Questions
- [Operating Instructions](#)
Key features and how to use them

Technical Questions Database - Netscape
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<input type="checkbox"/>	Guidance and Control	345
<input type="checkbox"/>	In Situ Experiment Design	346
<input type="checkbox"/>	In Situ Instruments	346
<input type="checkbox"/>	Integration & Test Operations	352
<input type="checkbox"/>	KSC Launch Pad	313
<input type="checkbox"/>	Launch Approval/NEPA	311
<input type="checkbox"/>	Launch Vehicle Target Specification Preparation	312
★	Materials and Processes	352
<input type="checkbox"/>	Mechanical Ground Support Equipment	352
★	Mechanisms	352
<input type="checkbox"/>	Microwave Design	333
<input type="checkbox"/>	Mission Analysis	312
<input type="checkbox"/>	Mission Concepts & Architectures	311
<input type="checkbox"/>	Mission Control Operations	361
<input type="checkbox"/>	Mission Operations System - Design	314
<input type="checkbox"/>	Mission Operations System - Operational Readiness	314
<input type="checkbox"/>	Monitor & Control Automation	394
<input type="checkbox"/>	Monitor and Control Software	363
<input type="checkbox"/>	Navigation	312
<input type="checkbox"/>	Navigation Software	312
<input type="checkbox"/>	Operations Planning	310
<input type="checkbox"/>	Optical Sensors	346
<input type="checkbox"/>	Passive Optics	346

Technical Questions Database - Netscape
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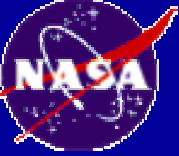
[Materials and Processes](#) 352 Cheng Hsieh

Question: Is there a Materials & Processes (M&P) engineering involvement in the design process?
Background:

Question: Does the material selected have the properties (mechanical, thermal, optical, etc.) necessary for the application? Are any alternative materials considered? Are there any processing constraints requiring consideration? Has the special precaution of materials being addressed (e.g., toxicity and brittleness of Be)? For materials with no prior relevant flight experience, have they been qualified for use in the mission environment?
Background:

Question: Has a Materials and Processes Identification and Usage List been prepared? For materials being used in "non-standard" applications, are Materials Usage Agreements or waivers needed?
Background:

Question: Has the potential for the materials to contaminate and adversely affect the performance of sensitive systems been evaluated? Is there a need for thermal vacuum bakeouts of structures and materials? *Background:*



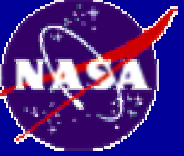
Reality Check #2

- On-line survey assessing Usefulness and Usability
- Going in “beliefs”
 - Minimal system implementation = perceived usability problems
 - Useful to individuals working flight projects
 - Marginal use to others

Survey - Netscape

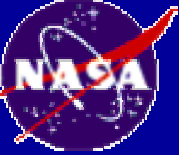
You must complete the entire survey before submitting

	Strongly Disagree		Neutral		Strongly Agree		
	1	2	3	4	5	6	7
Perceived Usefulness							
1 Using the system improves my performance in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2 Using the system in my job increases my productivity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3 Using the system enhances my effectiveness in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4 I find the system to be useful in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Perceived Ease of Use							
5 My interaction with the system is clear and understandable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6 Interacting with the system does not require a lot of my mental effort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7 I find the system to be easy to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8 I find it easy to get the system to do what I want it to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Intention to Use							
9 Assuming I have access to the system, I intend to use it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10 given that I have access to the system, I predict that I would use it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Job Relevance							
11 In my job, usage of the system is important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12 In my job, usage of the system is relevant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Optional							
Employee Badge	<input type="text"/>						
Primary Job Function	Management						
Are you currently working on flight project?	<input type="radio"/> Yes <input checked="" type="radio"/> No						

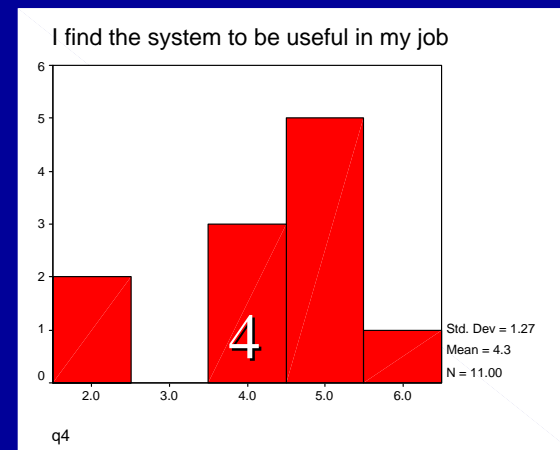
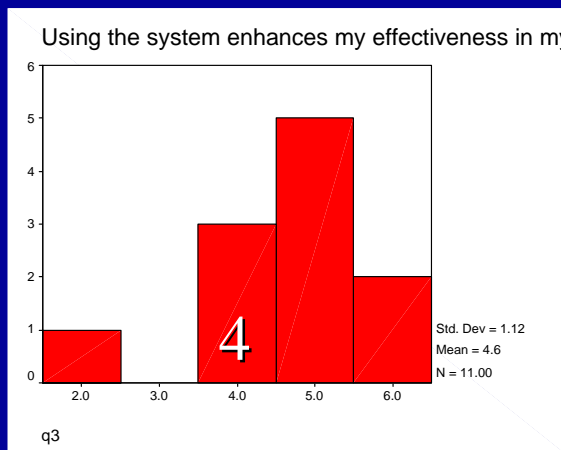
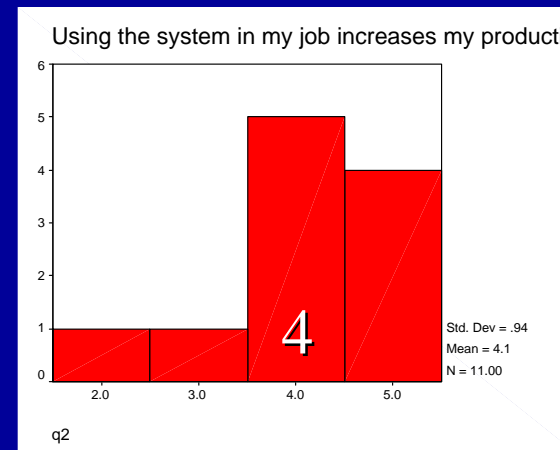
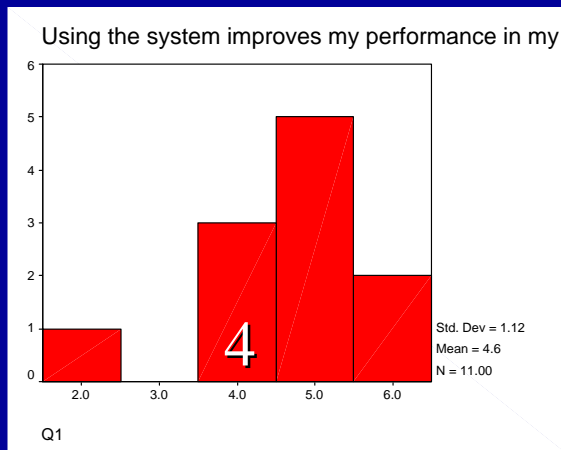


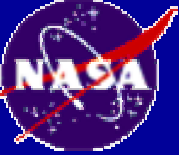
Survey Results

- Had to beg to get people to take survey
 - More email messages than survey responses
 - Despite small sample sizes, got reasonable data
- Mostly constructive feedback
 - Suggestions for content
 - Associated resources
 - “Here’s the list of questions we use on ...”
 - Suggestions (relatively few) on functionality
- One suggestion on how to better spend the \$

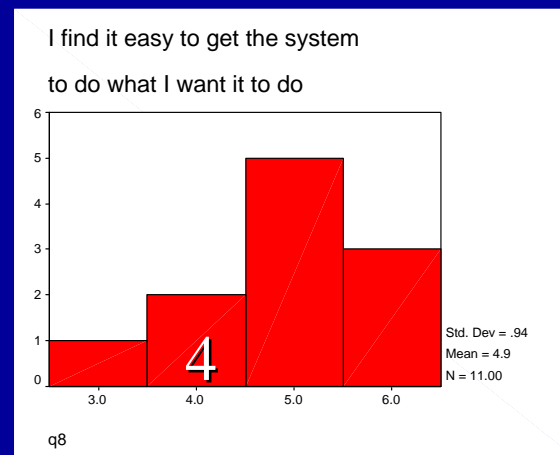
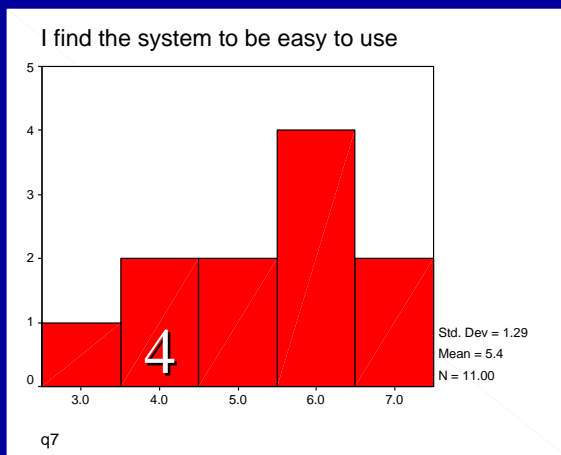
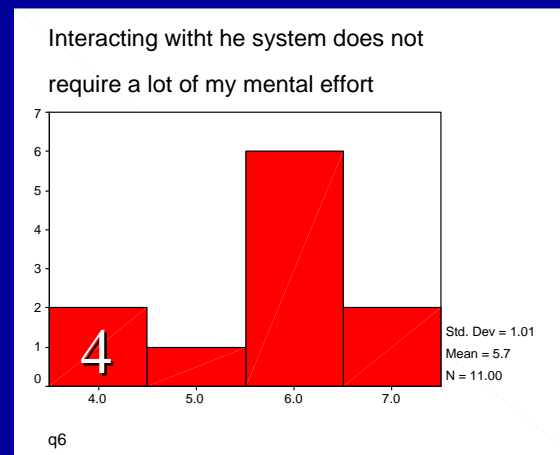
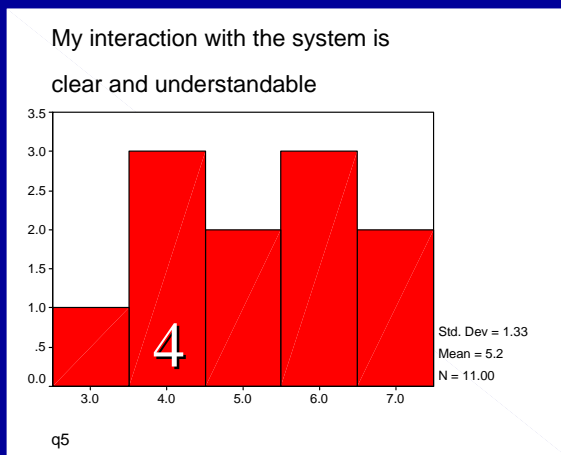


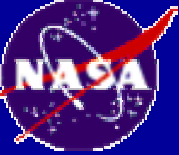
Usefulness ✓OK (whew!)





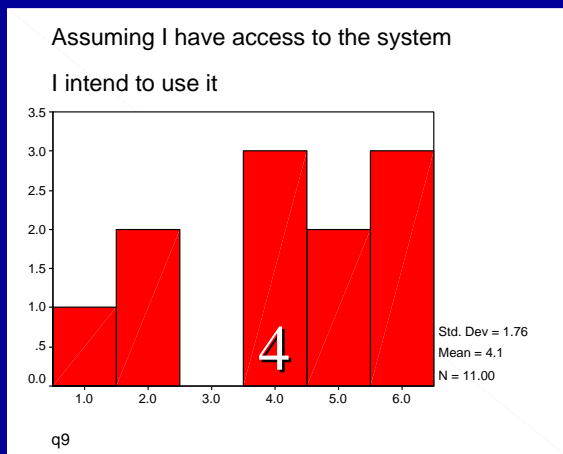
Usability ✓ OK (!)



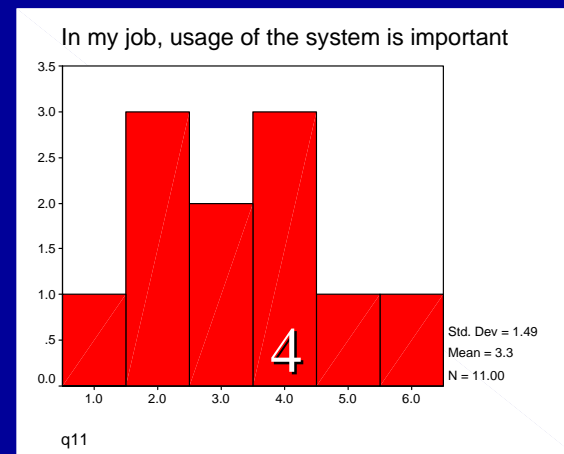


Intent to Use (???)

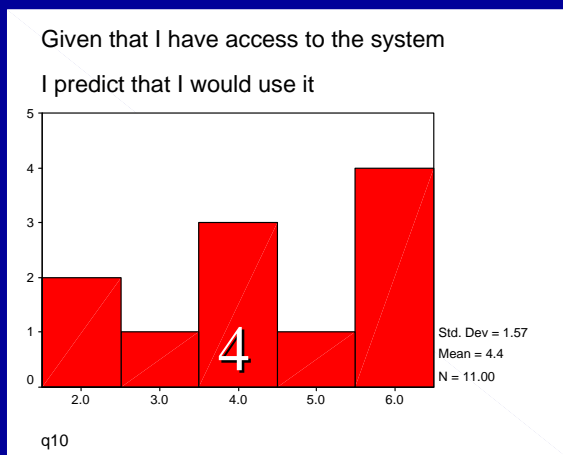
Intent to Use



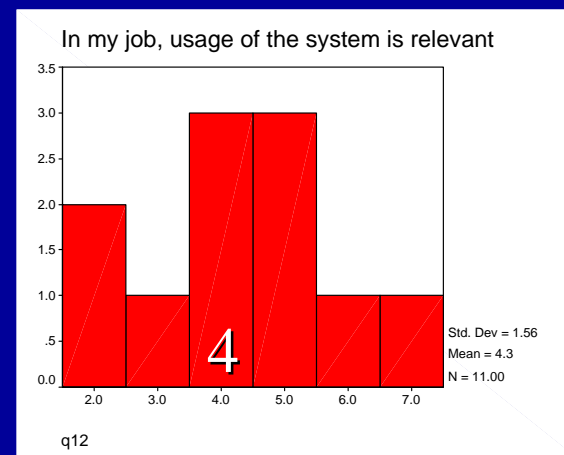
Important

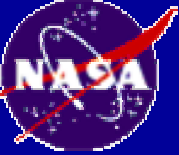


Predict to Use



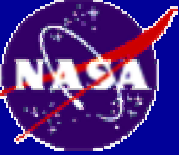
Relevant





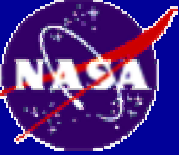
From the Comments

- “List of questions could be intractable...”
- “We are overwhelmed with work and don’t have time to use a system like this...we barely have time to get the highest priority work accomplished”
- “Not currently working toward a review...”
- “I didn’t find anything in [my area of interest]”
- Would use
 - “...as a review board member”
 - “...if I were working on a flight project”
 - “...to locate the right people”
- “Useful but a bit cumbersome”



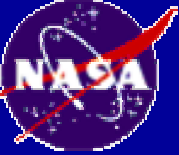
~Conclusions

- System functionality is good enough (bummer)
- Need to extend content to cover additional technical disciplines
- Primary users ARE NOT flight project personnel, not during design activities
 - Info most salient when approaching a review
 - Prefer to have information “chauffered”
 - Need to target Line Management, Experts, Review board members, QA/MA



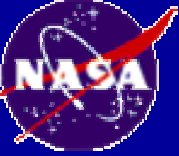
Implications

- For flight projects:
 - If people are too overwhelmed just doing their job -- they can't take advantage of risk-reducing knowledge
 - Need to have someone who's role is to seek out, evaluate, determine relevance of lessons learned type information (chauffering)
 - Project personnel benefit from combo of tidbits and contextual insights from informed reviewers
 - Reviewers benefit from checklists and reminders



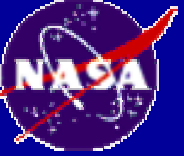
Implications

- For tool developers
 - Good Enough just might be good enough
 - Users might not need the “bells and whistles”
 - Effort may be better put into content
 - Need to consider the way people work
 - Even a small delta to the workload may be perceived as “too much” in high stress situations
 - Actual users may be different from original target
 - JPLers used to “peer review” and inquisition → Questions OK
 - Doesn't hurt to have upper management support
 - Pays to step back and evaluate before committing lots of resources



Future Reality Check

- Given just how context-dependent the usefulness of information is, and
- The sheer volume of “tidbits” applicable to any flight project
- When we create these resources (especially those based on “lessons learned”)
- **What are the implications of NOT using a resource that could have prevented a problem?**



The End.