Announcements

- Please sit with your second (numbered) team from last class.
- (Or, if you were absent, choose a team to sit with.)
Learning Goals for Today

Be able to:

- Recognize and explain factors that affect team dynamics,
- Avoid common written communication errors, and
- Identify key traits of high-quality written communication.
A **metric** is a quantity that can be measured, e.g.,
- The number of minutes a train arrives after its scheduled time,
- The number of miles per gallon a car gets in city driving, or
- The number of passing test cases.

A **dimension** is an aspect of quality, e.g.,
- The timeliness of a rail system,
- The fuel efficiency of a car, or
- The functional correctness of some software.
“Functional” versus “Nonfunctional”

- A *functional requirement* is a requirement about *what* the system does, e.g.:
  - The laptop order page shall offer three warranty options: 1-year, 2-year, and 3-year.

- A *nonfunctional requirement* is a requirement about *how* the system is or about *how* it does what the functional requirements demand, e.g.:
  - The warranty options shall be easy to update.
  - The warranty options shall be displayed prominently.
An artifact is a tangible work product, something created by a software engineer. E.g.:

- Code,
- Test cases,
- Scripts,
- User documentation,
- etc.
Reflection on the Team Exercise

- Share differences you saw between how your first team (with matching requirements) and second team (with differing requirements) operated.
- Choose one illustrative contrast and a spokesperson to share that contrast with the class.
Reflection on the Team Exercise

- Identify and share instances where your teammates on your second team worked together to accomplish something they might not have been able to accomplish individually.

- Identify why your team was effective in that instance—what lesson other teams might learn from your success.

- Choose one illustrative example and lesson and a different spokesperson to share that example and lesson with the class.
Case Study Analysis

Where students lost points:

- Not answering the question asked
- Writing problems (e.g., not using a spell checker)
- Answering in generalities instead of specifics from the case study
- Making statements that were not backed up by the content of the case studies
Case Study Analysis

Where students excelled:

- Recognizing that human error is inevitable and software should be designed to tolerate it
- Pointing out how many errors contributed to the failure
- Noting that the errors humans made were both programming mistakes and other misjudgments
Describe in one sentence the software system that failed.

“The software system that failed was one that was supposed to switch primary communications on a space shuttle after reaching orbit as well as reconfigure the link between the shuttle and its payload from a radio connection to a hardwired connection.”
Describe the sequence and timing of the events leading up to the failure.

“Prior to the failure, Knight Capital Americas LLC, the company utilizing the software, made a number of changes to its systems related to its order-handling processes to prepare for the Retail Liquidity Program (RLP) at the New York Stock Exchange scheduled for August 1, 2012. The new code was to replace unused code within the software known as Power Peg; to do this, they repurposed the code used to engage Power Peg.”
“Power Peg was used until 2003, and it was modified in 2005. Power Peg was left in the code in case it was called, but Knight ceased testing of this code section. The new RLP code began deployment on July 27, 2012 on a limited number of servers. However, during deployment one of the eight servers that needed the new RLP code did not receive a copy, and it still had Power Peg code which ran on the same engaging sequence.”
**Case Study Analysis**

3. Summarize the causes of the failure.

“One cause of the failure was *not removing code* that was no longer necessary for the system to run and putting it in a place that later ended up processing a number of orders that were never meant to be processed. There was *no protocol for accessing the unused code or for testing this code*.\)
“The failure was also caused by the lack of action when Knight **continually put off applying all the controls** and processes that were required by the Exchange Act Rule 15c3-5. The **absence of a second technician** reviewing the code for the eighth server also played a major role in this failure. In general, the lack of essential controls and processes led to the August 1, 2012 failure.”
Case Study Analysis

From the NASA case study . . .

“There were several causes of this failure, including the use of full-word alignment without locking down output commands. Monitoring in the software production facility is also at fault because none of the levels of testing were programmed to detect this kind of error.”
“SAIL testing of the PSP port modding failed to test the switch from RF to umbilical. SAIL testing of the S-band/Ku band handover colorred failed to report that they had to manually initiate a handover during testing. The SAIL testing team did not report the failure because of previous problems with the test resulting from lab-setup issues.”
List the direct and indirect impacts of this failure…

“There was the loss of more than $460 million for Knight, which was a direct impact. This was due to the 212 incoming parent orders that were processed by the defective Power Peg code.”
“The failure **indirectly impacted** other market participants. Some participants received **less favorable prices** than they would have while others received **more favorable prices**.”

“The failure connected **Knight** to the violation of Rules 200(g) and 203(b) of Regulation SHO, which was an **indirect impact**. This impact caused Knight to pay a civil money penalty in the amount of $12 million to the United States Treasury and to **satisfy undertakings**.”
“There were also lost opportunities, which were an indirect impact on the technology team of Knight. The hours of trying to identify and address the SMARS problem could have been used to perform other tasks.”
List at least three steps the company. . .

“One step Knight Capital Americas took was to set capital thresholds. They had an account that held many types of positions, including the ones with unfulfilled parent orders, and this account had a $2M limit, but it was not linked to any automated controls for Knight’s overall finances.”
List at least three steps the company...

“Another step they took was creating their post-execution position monitoring system, but this system relied completely on human monitoring and did not have any alerts to show financial exposure. A third step that they took was to address the problem on August 1: while this was happening, they had their technology team try and figure out what was going wrong because they needed to fix it before more money was lost. But the team started by uninstalling the new RLP code from one of the seven servers where it was correctly working, which worsened the problem.”
Describe at least two other steps the company... 

“Another step that NASA could have taken in order to avoid the problem is to update the code that requires all commands to be at even numbered addresses to signal an error if there are commands at odd numbered addresses instead of continuing to run. This would have prevented the code from running during testing and would have been a more obvious sign that something was wrong. In addition, they could have changed the code to remove this requirement if possible.”
Describe the role that humans played…

“Humans played a large role in the failure that occurred. They were involved in the deployment of the faulty code, they failed to catch the error before trading began, they failed to monitor the trades, and they relied on a technical team to identify and address the problem in a live trading environment.”
You may submit writing changes to Homework 2.3 (the memo on your software quality comparison) through Git up until 9:00 a.m. on Wednesday.