

# Don't Discount the Developer

Tales from the Technical Dark Side

Remember to complete your evaluation for this session within the app!

**Session ID:** 

11249

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#### **Agenda**

- Introductions
- Dark Side Technical Practices and Procedures
- Dark Side Coding Patterns
- Stepping Into the Light Going Forward Recommendations



#### Introductions

- Joe Tseng
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- Tammy Vandermey
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#### **About O2Works**

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## The Technical Dark Side Practices and Procedures

- Based on experience, there are many technical practices that can lead a project or an IT group to the technical dark side. The ones we have seen often include the following:
  - Believe that any technical resource will do
  - Underestimate the Importance of Source Code Control
  - Overlook the Importance of Deployment Tools or Standards
  - Failure to Instance Plan
  - Documenting for the Sake of Documenting



#### Dark Side Practices and Procedures "Any Resource Will Do"

- The proper selection of technical resources is an often overlooked aspect to any IT project. Failure to utilize competent resources can be catastrophic to project success.
- Technical resource selection is sometimes characterized by following beliefs:
  - Cheaper is better.
  - Off-shore means a 24 hour project cycle and better productivity
  - It's the engagement partners responsibility
  - Resumes are all that's needed, forget the interview
  - Module experience trumps long-term industry experience



# Dark Side Practices and Procedures "Any Resource Will Do"

- Buyer beware, these things actually do happen:
  - Engagement companies don't actually have known technical resources, but will find them anonymously off the "street" when projects arise.
  - Engagement companies send more experienced technical resources to interviews and swap them out later – after the opening stages of projects. These resources are sometimes replaced by resources with minimal work experience
  - Phone interviews are conducted by experienced professionals but different resources show up on site
  - Multiple resources are assigned to the same project tasks in order to "train" more resources.
  - Junior resources "work" during the day at client sites but turn over actual coding to more experienced off-shore resources in the off-hours.
  - Junior resources use client sites as opportunities to experiment and learn.



#### Dark Side Practices and Procedures "Any Resource Will Do"

- The end result of poor technical resource choices
  - Last-minute, frantic go-lives that often fail to meet dates or deadlines
  - Project cost explosion
  - Costly Engagement partner replacement
  - Performance problems
  - Poor code that is difficult and costly to maintain
  - Un-orthodox coding methods that violate standards and thus may invalidate Oracle support agreements
  - Costly rewrites

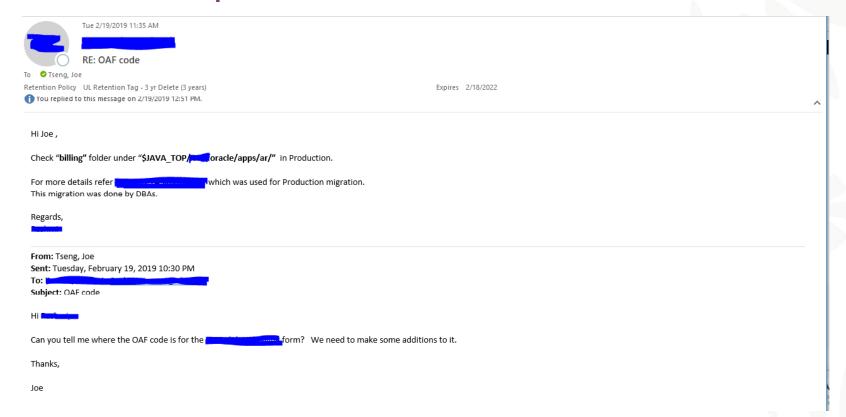


"Underestimate the Importance of Tools - Source Code Control"

- Every environment needs an active and usable source code control repository tool.
  - Creating date named folders in Microsoft Windows Explorer is NOT a tool
  - Using your Production environment for source code is NOT a tool
- Not having and using a source code control tool is an invitation to disaster
  - Lost, working versions of code can set a project timeline back as functionality is rebuilt
  - Accidental overwrites or loss of code



#### "Underestimate the Importance of Tools – Source Code Control"





"Underestimate the Importance of Tools – Source Code Control"

- There are plenty of tool options available for purchase.
- If you choose not to purchase a tool, there are plenty of free source code control repository tools available
  - SVN
  - PVCS
  - Git
  - Tortoise SVN (SVN w/ a Windows Shell)
  - Tortoise Git (Windows Shell for Git)
- Source Code Control is critical to maintaining a version history of all source code objects and being able to diagnose code control issues.



"Underestimate the Importance of Tools – Source Code Control"

- At many sites that have made the well intentioned investment into a source code control
  tool, the improper use of the tool is a point of failure
  - Code Dumping grounds Failure to properly categorize code can lead to a massive object dumping ground – or even duplicate code within the tool repository
  - Incomplete code control Critical objects may be missing from code control.
  - Lack of integration with deployment methodology or tool



#### "Overlook Deployment"

- An inadequate view of the importance of code deployment is another contributor to the technical dark side
  - A solution must not be viewed as "working" unless it is proven that it can be properly and consistently deployed to Production.
  - Proper testing includes deployment that follows an identical path to production
  - Deployments that have gone wrong can be costly
- Deployment Tools in an EBS environment can be expensive
  - May need custom tailoring to your environment
  - Have much thought and practical experience built into them
- The alternative to a deployment tool may be standard procedures and scripts
  - Require training specific to your environment
  - Often involve scripts that need to be suited to the specific solution
  - Can be error prone



#### "Overlook Deployment"

- At a minimum, a good Deployment Tool or Methodology will include the following:
  - Ability to integrate with source code control. Deployments must be able to pull specific versions of code
  - Ability to deploy to any EBS environment
  - Ability to deploy all types of EBS objects
    - Database objects (tables, views, PLSQL packages, etc)
    - Oracle Forms and Reports
    - BI Publisher templates and Data Templates
    - OAF pages
    - Configurations



## Dark Side Practices and Procedures "Failure to Instance Plan"

- Instance Planning is another overlooked aspect of the EBS technical picture
  - Having everyone "swim" in a 3 year old testing instance is not a plan
  - Stale instances lead to stale results
  - Instance refreshes must be integrated into a project plan.
  - Optimal environments have an instance cloned weekly, if not daily.
  - Investments in hardware, personnel, and procedures to utilize available cloning tools are well worth it.



#### "Documenting for the Sake of Documenting"

- Too often, IT environments often lack a well thought out plan for storing and cataloging documentation.
  - Documentation dumping grounds are the "norm". Approaches are often scattered and very often lack a means of finding proper documentation, thus further perpetuating the problem. These dumping grounds can be found in
    - Windows folders
    - SharePoint sites
    - Source Code Control
  - Additionally, the requirement to use outdated templates also results in the creation of documentation that do not adequately describe the solution being implemented.
  - Without a plan, the reality is that though a time consuming part of the project, created documentation is practically useless.







# Dark Side Coding Practices

#### **Dark Side Coding Practices**

- Over the years, we've seen a number of coding practices that are less than optimal.
   Though invisible to most, poorly code written code is costly for a number of reasons
  - Code Maintenance The inability to read code can be expensive as time is spent weeding through unnecessarily complex or bloated code
  - Code "inertia" Functionality that is initially written with poor code must be replicated if a rewrite is necessary
  - Performance problems Poor coding approaches and spaghetti logic often leads to poor performance
  - Violation of Oracle standards Code that bypasses API's violates Oracle support agreements
  - Organizations can be held "hostage" by poor code
  - Rewrites of major functionality as code is finally deemed to be too unstable



- 1. The Clown Car
- 2. The Superman
- 3. The Tree Killer
- 4. The 7-11 The Database is not your convenient store
- 5. The Ted Kennedy
- 6. The Matryoshka Doll
- 7. The Move Along Nothing To See Here
- 8. The NULLIFIER
- 9. The Straight Jacket
- 10. The Hard Hat



#### Dark Side Coding Patterns #1 – "The Clown Car"

- Failing to modularize your code, putting everything in a single code unit.
- Consequences:
  - No code re-usability Single use code
  - Poor Code maintainability



#### #2 - "The Superman"

- Instead of working out access issues properly, set context to be whatever works.
- Consequences:
  - Unintended operations are made with unintended code authorizations.



#3 - "The Tree Killer"

- Instead of using records, declare variables for EVERYTHING.
- Consequences:
  - Unnecessary Code Bloating
  - Poor Code Maintainability



#3 - "The Tree Killer"-

```
1 return status
                         VARCHAR2 (1) := 'S';
l_msg_count
l_msg_data
l_cust_trx_id
                        NUMBER;
                        VARCHAR2 (2000);
                        NUMBER;
                        NUMBER:
1_cust_cm_id
                        VARCHAR2 (20);
1 trx number
1 customer id
                        NUMBER:
l_invoice_number
                        VARCHAR2 (60);
l invoiceid
                        VARCHAR2 (60);
l_billing_type
                        VARCHAR2 (256)
                                          := NULL;
l_inv_amt
                        NUMBER;
1 rec amt
                        NUMBER;
1 cm amt
1_ref_rec_amt
                        NUMBER;
1 ref cm amt
                        NUMBER;
l applied cm amt
                        NUMBER;
l_applied_rec_amt
                        NUMBER;
                        NUMBER;
1_qty
                        NUMBER
                                         := 0;
                        NUMBER
1_count
                                         := 0;
                        NUMBER:
l cash receipt id
1_invoice_count
                        NUMBER
                                         := 0;
1_cm_count
                        NUMBER
1_msg_data_out
                        VARCHAR2 (240);
1_party_name
                        VARCHAR2 (100);
1_customer_trx_id
                        NUMBER:
1 trx header id
                        NUMBER;
l invoice error
                        VARCHAR2 (240);
1 receipt method id
                        NUMBER;
1 amount applied
                        NUMBER;
1 currency
                        VARCHAR2 (20);
1_exchange_rate_type
                        VARCHAR2 (20);
                        VARCHAR2 (20);
l_exchange_rate_date
                        NUMBER:
l_bill_to_site_use_id
                        NUMBER:
l_ship_to_site_use_id
                        VARCHAR2 (240);
1 description
                        VARCHAR2 (20);
1_pmt_method
1_bank_account_id
                        NUMBER
                                         := NULL;
1_bank_cnt
                        NUMBER;
l_party_id
                        NUMBER;
l_trx_type_id
                        NUMBER;
                        NUMBER
1 total count
                                         := 0;
l line count
                        NUMBER
                                         := 0;
                        NUMBER
                                         := 0;
1_tot_line_count
                        NUMBER
1 count bad cust
                                         := 0;
                        NUMBER
1_total_errcount
                                         := 0;
                        NUMBER
1_total_refund_usd
                                         := 0;
                        VARCHAR2 (60):
l_usta_remit
l_remit_message
                        VARCHAR2 (1000);
1_source
                        VARCHAR2 (20);
1_trx_date
                        DATE:
1 bank account type
                        VARCHAR2 (20);
l_amt_applied_total
                        NUMBER
                        VARCHAR2 (150);
l_div_id
1 privatelabelgroup
                        VARCHAR2 (80);
l_invoice_date
                        DATE;
```



## Dark Side Coding Patterns #4 – "The 7-11"

- Using the database as a convenient store visiting it as often as possible.
- Consequences
  - Poor program performance
  - Redundant logic
  - Poor Code maintainability



#4 - "The 7-11"

```
CREATE OR REPLACE FORCE VIEW "APPS"."ARBPA EADER V"
SELECT xxul_bnp_bpa_utils_pkg.init (rcta.customer_trx_id) init
                                                        EADER V" ("INIT", "INTERCO DATE", "BILLTO COUNTRY", "SHIP TO COUNTRY", "CANADA GST TAX",
        xxul_bnp_bpa_utils_pkg.get_interco_date (rcta.customer_trx id)
           interco date,
        xxul_bnp_bpa_utils_pkg.get_bill_to_country (rcta.customer_trx_id)
           billto country.
        xxul_bnp_bpa_utils_pkg.get_ship_to_country (customer_trx_id)
           ship_to_country,
        xxul_bnp_bpa_utils_pkg.get_ca_gst_tax (customer_trx_id)
           canada_gst_tax,
        xxul_bnp_bpa_utils_pkg.get_ca_qst_tax (Gustomer_trx_id)
           canada_qst_tax,
        xxul bnp bpa utils pkg.get bill to state (customer trx id)
           bill to state,
        xxul_bnp_bpa_utils_pkg.get_ship_to_state (customer_trx_id)
           ship_to_state,
        xxul_bnp_bpa_utils_pkg.get_bill_to_province (customer_trx_id)
           bill to province,
        xxul bnp bpa utils pkg.get ship to province (customer trx id)
           ship_to_province,
        xxul_bnp_bpa_utils_pkg.turkey_currency_switch (
           rcta.customer_trx_id)
           tur currency,
        xxul_bnp_bpa_utils_pkg.get_turkish_conversion rate (
           customer_trx_id)
           tur conv,
        xxul_bnp_bpa_utils_pkg.get_fus_total_amt_due (rcta.customer_trx_id)
           fus_total_amt_due,
        xxul_bnp_bpa_utils_pkg.get_applicant_acct_num (
           rcta.customer trx id)
        xxul bnp bpa utils pkg.get applicant addr (rcta.customer trx id)
           applicant addr,
        xxul_bnp_bpa_utils_pkg.xxul_bnp_get_ca_qst_reg_num (
   rcta.customer_trx_id)
           gst reg num,
        xxul_bnp_bpa_utils_pkg.xxul_bnp_get_ca_gst_reg_num (
           rcta.customer_trx_id)
           gst_reg_num,
        xxul_bnp_bpa_utils_pkg.get_canada_gst_tax_type (
           rcta.customer_trx_id)
           canada_gst_tax_type,
        xxul bnp bpa utils pkg.get canada qst tax type (
           rcta.customer trx id)
           canada qst tax type,
        xxul bnp bpa_utils_pkg.get_canada_gst_tax_rate (
           rcta.customer trx id)
           canada gst tax rate,
        xxul_bnp_bpa_utils_pkg.get_canada_qst_tax_rate (
           rcta.customer trx id)
           canada_qst_tax_rate,
        xxul_bnp_bpa_utils_pkg.get_canada_gst_tax_amount (
           rcta.customer_trx_id)
           canada_gst_tax_amount,
        xxul_bnp_bpa_utils_pkg.get_canada_qst_tax_amount (
```



## Dark Side Coding Patterns #5 – "The Ted Kennedy"

- Left justify your code so its impossible to read
- Consequences:
  - Poor Code maintainability



#5 – "The Ted Kennedy"

```
IF 1v item number IS NOT NULL
BEGIN
 SELECT instance_id
INTO ln_instance_id
 FROM (SELECT cii.instance_id
FROM csi item instances cii,
mtl_system_items_b msib
 WHERE 1 = 1
 AND cii.active end date IS NULL
 AND msib.organization_id =
AND UPPER (msib.inventory_item_status_code) = 'ACTIVE'
AND cii.system_id IN (
SELECT system_id
FROM csi_systems_b
 WHERE parent_system_id IN (
SELECT system_id
FROM (SELECT cii.instance id,
 cii.system id,
cst.NAME
 system number
FROM apps.csi_item_instances cii,
apps.hz cust accounts hzc,
apps.csi_systems_tl cst
 WHERE cii.owner_party_account_id =
hzc.cust_account_id
AND hzc.account_number =
lv_account_num
AND hzc.status =
AND cii.install_location_id =
lv install site
AND cst.system id =
cii.system_id
AND_cst.LANGUAGE =
USERENV
 ('lang')
AND cii.active_end_date IS NULL
AND instance type code =
 (SELECT lookup code
FROM apps.csi_lookups 1
WHERE 1.lookup_type(+) =
 'CSI_INST_TYPE_CODE'
AND UPPER
 (1.meaning
UPPER
 ('MANUFACTURER'
AND cii.inventory_item_id =
msib.inventory item id
NVL (lv_item_number, msib.segmentl)
```



#6 - "The Matryoshka Doll"

- Instead of modularizing, nest your IF conditions and blocks to a ridiculous depth.
- Consequences:
  - Poor Code Maintainability
  - Redundant Logic
  - Loss of modularity and re-use



#### #6 – "The Matryoshka Doll"

```
IF cuv applicant create.US ETHNIC ORIGIN = 'Hispanic or Latino' THEN x pei information1 :='Y';
    ELSE
        IF cuv applicant create. US ETHNIC ORIGIN = 'American Indian or Alaska Native (Not Hispanic or Latino)' THEN x pei information2 :='Y';
                IF cuv applicant create.US ETHNIC ORIGIN = 'Asian (Not Hispanic or Latino)' THEN x pei information3 :='Y' ;
                        IF cuv applicant create.US ETHNIC ORIGIN = 'Black or African American (Not Hispanic or Latino)' THEN x pei information4 :='Y';
                                IF cuv applicant create.US ETHNIC ORIGIN = 'Native Hawaiian/Other Pacific Islander(Not Hispanic/Latino)' THEN x pei information5 :='Y';
                                        IF cuv applicant create.US ETHNIC ORIGIN = 'White (Not Hispanic or Latino)' THEN x pei information6 :='Y' ;
                                               IF cuv_applicant_create.US_ETHNIC_ORIGIN = 'Two or More Races (Not Hispanic or Latino)' THEN x pei information7 :='Y';
                                                        IF cuv applicant create.US ETHNIC ORIGIN = 'Opt Out' THEN x pei information8 := 'Opt Out';
                                               END IF:
                                        END IF;
                                END IF;
                        END IF;
                END IF;
        END IF;
END IF;
```



#7 – "The Move-Along-Nothing-To-See-Here"

- Hide Exceptions so no one knows or log them to a place no one will ever look. This is otherwise known as the infamous "WHEN OTHERS THEN NULL"
- Consequences
  - Lost errors that can have unknown multiple downstream ramifications



## Dark Side Coding Patterns #8 – "The NULLIFIER"

- Instead of understanding and using variable scope within block structures, set all your variables to NULL "JUST IN CASE"
- Consequences:
  - Poor Code Maintainability
  - Possibility of unintended consequences when failing to reset variables



#8 - "The NULLIFIER"

```
ln price := NULL;
lv_salesper := NULL;
ln gl id rev := NULL;
ln_location := NULL;
ln gl default seg := NULL;
lv segment := NULL;
lv table name := NULL;
ln seg num := NULL;
lv_segment1 := NULL;
lv segment2 := NULL;
lv segment3 := NULL;
lv segment4 := NULL;
lv_segment8 := NULL;
lv segment9 := NULL;
lv trnsegment1 := NULL;
lv trnsegment2 := NULL;
lv trnsegment3 := NULL;
lv_trnsegment4 := NULL;
lv segment5 := NULL;
lv segment6 := NULL;
lv segment7 := NULL;
lv_trnsegment8 := NULL;
lv trnsegment9 := NULL;
---sales
lv salesegment1 := NULL;
lv salesegment2 := NULL;
lv_salesegment3 := NULL;
lv salesegment4 := NULL;
lv_salesegment8 := NULL;
lv salesegment9 := NULL;
---service
lv sersegmentl := NULL;
lv_sersegment2 := NULL;
lv sersegment3 := NULL;
lv sersegment4 := NULL;
lv sersegment8 := NULL;
lv sersegment9 := NULL;
lv_default := NULL;
lv_tbl_seg1 := NULL;
lv tbl seg2 := NULL;
lv_tbl_seg3 := NULL;
lv tbl seg4 := NULL;
lv tbl seg8 := NULL;
lv tbl seg9 := NULL;
in_ln_org_id := NULL;
---Version 1.1 Starts
ln contract number := NULL;
ln line number := NULL;
```



#9 - "The Straight Jacket"

- Limit your code to just 80 characters and wrap as needed
- Consequences:
  - Poor Code Maintainability and Readability



#### **Top Ten Coding Pattern Killers**

#9 - "The Straight Jacket"

```
IF in_psn IS NULL
      'PSN is required field for Service Contracts/IB details service';
   o_error_code := 2;
   FOR srv_hdr_dtls_rec IN srv_hdr_dtls_cur
     out sc contract hdr tbl.EXTEND;
     out_sc_contract_hrd_rec.service_contract_number :=
                                      srv hdr dtls rec.contract number;
     out_sc_contract_hrd_rec.contract_header_id := srv_hdr_dtls_rec.ID;
     out_sc_contract_hrd_rec.contract_number_modifier :=
                             srv_hdr_dtls_rec.contract_number_modifier;
     out_sc_contract_hrd_rec.description :=
                                    srv_hdr_dtls_rec.short_description;
     out_sc_contract_hrd_rec.contract_start_date :=
                                   srv_hdr_dtls_rec.contract_start_date;
     out sc contract hrd rec.contract end date :=
                                    srv_hdr_dtls_rec.contract_end_date;
     out_sc_contract_hrd_rec.total_amount :=
                                         srv_hdr_dtls_rec.total_amount;
     out_sc_contract_hrd_rec.negotiation_status :=
                                   srv hdr dtls rec.negotiation status;
     out_sc_contract_hrd_rec.contract_group := srv_hdr_dtls_rec.NAME;
     out_sc_contract_hrd_rec.status := srv_hdr_dtls_rec.sts_code;
     out_sc_contract_hrd_rec.cust_po_number :=
                                       srv_hdr_dtls_rec.cust_po_number;
     out_sc_contract_hrd_rec.payment_term :=
                                         srv_hdr_dtls_rec.payment_term;
     out_sc_contract_hrd_rec.price_list := srv_hdr_dtls_rec.price_list;
     out sc contract hrd rec.customer party id :=
                                             srv hdr dtls rec.party id;
     out sc contract hrd rec.customer party number :=
                                         srv hdr dtls rec.party number;
     out_sc_contract_hrd_rec.party_site_number :=
                                    srv_hdr_dtls_rec.party_site_number;
     out_sc_contract_hrd_rec.customer_name :=
                                           srv_hdr_dtls_rec.party_name;
     out_sc_contract_hrd_rec.cust_account_number :=
                                       srv hdr dtls rec.account number;
     out_sc_contract_hrd_rec.cust_account_id :=
                                      srv hdr dtls rec.cust account id;
      -- Get bill to account details
     get_bill_to_details
                   (srv hdr dtls rec.bill to site use id,
                   out_sc_contract_hrd_rec.bill_to_cust_party_number,
                   out sc contract_hrd_rec.bill_to_cust_party_name,
                   out_sc_contract_hrd_rec.bill_to_party_acc_number,
                   out_sc_contract_hrd_rec.bill_to_party_site_number,
                    out_sc_contract_hrd_rec.bill_to_party_location,
                   out_sc_contract_hrd_rec.bill_to_cust_address_linel,
                   out sc contract hrd rec.bill to cust address line2,
                   out_sc_contract_hrd_rec.bill_to_cust_address_line3,
                   out_sc_contract_hrd_rec.bill_to_cust_address_line4,
```



#### **Top Ten Coding Pattern Killers** #10 – "The Hard Hat"

- Instead of parameterizing, hard code literal values whenever you can
- Consequences:
  - Poor Code Maintainability
  - Loss of code re-use



#### **Top Ten Coding Pattern Killers**

#10 - "The Hard Hat"

```
-- Initialize Item Details for UL Mark
SELECT segment1.
       description
  INTO g_ys_service_items('ULMARK').item number,
       g ys service items ('ULMARK').item description
FROM mtl_system_items_b
WHERE organization id = 133
AND segment1 = '30201237';
-- Initialize Item Details for ALSP
SELECT segment1,
       description
  INTO g_ys_service_items('ALSP').item_number,
      g_ys_service_items('ALSP').item_description
FROM mtl system items b
WHERE organization id = 133
AND segment1 = '30201236';
-- Initialize Item Details for ALSP Cover Line
SELECT segment1.
      description
  INTO g_ys_service_items('ALSPCOV').item_number,
      g_ys_service_items('ALSPCOV').item_description
FROM mtl system items b
WHERE organization id = 133
AND segment1 = '30034437';
-- Initialize Item Details for Inspection Service
SELECT segmentl,
       description
  INTO g_ys_service_items('SRV').item_number,
      g ys service items('SRV').item description
FROM mtl system items b
WHERE organization id = 133
AND segment1 = '30014613';
-- Initialize Item Details for Production Volume
SELECT segmentl,
      description
  INTO g_ys_service_items('PV').item_number,
      g_ys_service_items('PV').item_description
FROM mtl system items b
WHERE organization id = 133
AND segment1 = '30027940';
-- Initialize Item Details for Annual Fee
SELECT segmentl,
       description
  INTO g_ys_service_items('AF').item_number,
      g ys service items('AF').item description
FROM mtl system items b
```

WHERE organization\_id = 133
AND segment1 = '30027937';







# Stepping into the Light Going forward Recommendations

# Stepping Into the Light Going forward Recommendations

- Interview your technical resources before bringing them onboard
  - Request code samples to review coding techniques. Coding styles obviously vary between developers, but good coding practices will always include the following:
    - Well structured, intentional and consistent indentation scheme
    - Modularization and parameterization for reusability and maintainability
    - Limited code unit size
    - Generous use of free space to improve readability
    - Use of block structures to properly assign variable scope and life
    - Code that is self-documenting
      - Use of sensible variable names
      - Use of Anchored Data types as a means of documenting code intent
      - Use of table and cursor record types
      - Avoidance of redundant comments
  - Have resources write actual code in person as part of the vetting process
  - Use interview question that are scenario based that will identify actual problem solving skills



# Stepping Into the Light Going forward Recommendations

- If using an engagement partner, ask questions about who they have assigned to your project
  - How long have they been with the company
  - Ask for references
- Understand that despite the marketing material, off-shore technical work is not necessarily cheaper
- Choose experience over "exposure" to a specific needed module
- Use experienced resources for more complex tasks



# Stepping Into the Light Going forward Recommendations

- Implement a Source Code Control tool NOW if you have not yet done so
  - Make an investment into studying how best to structure the repository to suit your needs
  - Integrate your source code control tool with your deployment tool or methodology
- Do not overlook the importance of a clean solution deployment
- Review instance planning within your organization or project
- Re-think the why and how of technical documentation
- Perform code reviews as necessary to avoid bad coding patterns





## Q & A

Joe Tseng – <u>jtseng@o2works.com</u>

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**Session ID:** 

11249

Remember to complete your evaluation for this session within the app!

