

**EA Solutions for <CleanCrew National>**

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ICT 4010: Enterprise Architecture

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## **Identities Concealed**

The name of the author, company, providing SOA company, and positional title of the “vendor manager” have been concealed for security purposes to prevent any damage to the reputation of the real company. Names appearing in brackets are fake names used as replacements.

## Executive Summary

<CleanCrew National> is a national maintenance company, providing commercial cleaning services to thousands of clients nationwide. Information Technology is a core component of the company, especially its enterprise system, enabling employees to access large amounts of client and vendor data and perform everyday core business processes.

Although <CleanCrew National> does not institute an official Enterprise Architecture (EA) program, this paper uses EA principles and TOGAF<sup>1</sup> modeling to identify architectural problems within the company and provide recommended solutions. The EA analysis revealed issues in the areas of IT, Business Processes, Information & Knowledge, Controls/Metrics, and Data. Such issues revolve around inefficient processes, need for automation, lacking core features, unintegrated data, undocumented business knowledge, lack of system security/controls, and duplicate data.

The recommended solutions entail various changes to the company's enterprise system and the implementation of a knowledge management system. Changes to the enterprise system include streamlined processes, increased automation, a new Recruiting module, the implementation of a Vendor Portal, new security controls, changes accommodating data integration, and other miscellaneous changes discussed throughout.

As the recommended solutions are implemented, the company will benefit from IT efficiency, business processes enabled through IT, improved contractor relationships, tremendous time savings through automation and the Vendor Portal, reduced IT risks, and

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<sup>1</sup> TOGAF is a registered trademark of The Open Group.

security. The roadmap (Figure 5 of the Appendix) estimates a maximum transition time of 68 weeks (17 months) to reach the desired future state.

## General Background

<CleanCrew National> is a national maintenance company that specializes in meeting commercial cleaning needs for various nationwide clients—mostly restaurants and retail stores. The commercial cleaning services provided includes services such as janitorial work, carpet steam cleaning, floor stripping/waxing, power washing, window cleaning, high dusting, etc. Most of <CleanCrew National>'s work is performed by subcontracting the work to cleaning companies that are local to individual client stores, although technicians are also trained and relocated throughout the United States as field managers.

Client payment for services may be <CleanCrew National>'s direct form of profit, but it's overall profitability ultimately lies in a careful balance between client satisfaction, vendor satisfaction, and cost-savings through vendor negotiation and IT efficiency. Finding suitable vendors that can do the job properly results in client satisfaction and new job opportunities but having those same vendors do it at competitive prices is what actually generates profit since <CleanCrew National> must pay those same vendors. <CleanCrew National>'s primary business goals over the last decade has been increasing profit margins, onboarding more clients, and improving workflow efficiency.

At a high-level overview of the business processes: the Sales department onboards new clients by adding them to the system and documenting their cleaning requests and store information; clients then submit Work Orders to the system; Recruiting hires suitable contractors to complete the Work Orders and documents data on their services, pay terms, and insurance policies; Logistics is responsible for shipping chemicals and equipment to vendors; Customer Service deals directly with the clients and ensures QA (Quality Assurance) of jobs

performed; and, Accounting handles all invoices, which includes receiving payment from clients and paying contractors. Other departments and business functions have been excluded for reasons of simplification and relativity. Figure 1 of the Appendix is a Business Interaction Matrix, that visually depicts the relationship interactions between the organizations and business functions of <CleanCrew National> (The Open Group 2009, 8).

<CleanCrew National>'s primary enabling IT is its web-based enterprise system, connected to databases with client and vendor data, and accessible by all employees from any computer. The web-based enterprise system is the means by which nearly all business processes are performed. For this reason, it is imperative that the enterprise system works as efficiently as possible.

In conducting the EA analysis of the company, issues were found in the areas of IT, Business Processes, Information & Knowledge, Controls/Metrics, and Data. In order to efficiently and correctly fulfill the business processes and meet the business goals, recommended solutions have been provided for each of the major areas. Because <CleanCrew National>'s enterprise system is the core enabling IT and source of issues, the solutions recommended of course entail various changes to the enterprise system.

Because the enterprise system is a SaaS designed with SOA principles, changes needed are simply submitted to the providing company (<Cleaner's SOA>) who are responsible for altering and customizing components of the enterprise system. <CleanCrew National> is not responsible for the actual programming, but only for understanding the design and requirements needed to request.

As the recommended solutions are provided according to the provided roadmap, the architectural vision of success will thus entail end results of IT efficiency, business processes enabled through IT, improved contractor relationships, tremendous time savings through automation and the Vendor Portal, reduced IT risks, and security.

Please note that references are not used in the background of this paper because the information presented is based on my personal and intimate knowledge of the company, having worked at <CleanCrew National> headquarters off-and-on over a period of 10 years. However, references are used in the Analysis and Solutions sections to emphasize the importance of the issues and value of the solutions.

The figures referenced throughout the paper, listed in the Appendix, are made according to standard TOGAF vernacular suggested in *TOGAF Sample Catalogs, Matrices, and Diagrams*, with the exception of the High-Level Knowledge Management Diagram which follows the EA3 Cube model suggested in *Introduction to Enterprise Architecture*.

## **Identification of Major Architecture Issues**

### **Business Processes**

- Document Submission process is very cumbersome for contractors
- Submitted documents are often very difficult to identify, and pictures can never be matched to the store they belong to
- Document Processing is very cumbersome and time-consuming, with room for automation



- <Vendor Qualifications Manager>'s primary tasks of notifying contractors of missing core documents could easily be automated

### **Information & Knowledge**

- High risk of losing undocumented crucial business knowledge should the CEO, President, or Operations Manager leave
- Heavy dependence on Operations Manager for undocumented business knowledge increases worktime and delays business processes
- Training documents for new employees are not consolidated or managed in a way that allows clear and easy access for everyone

### **Controls/Metrics**

- Any employee can process any document, allowing room for misconduct and document tampering
- Auditing trails don't work for documents uploaded specifically through the Documents queue

### **Data**

- Unintegrated data across all departments is reducing communication and business process efficiency and creating risk for data loss/corruption
- Duplicate data regarding organization profiles causing confusion and slowing the database
- Inability to rename or delete organizations resulting in multiple organizations which create further clutter and confusion

## **Analysis of the Major Enterprise Architecture Issues**

### **Analysis of Information Technology Issues**

<CleanCrew National>'s enterprise system has several various processes that are inefficient or cumbersome, in need of either redesign and/or automation. Three general issues will be explored, followed by issues specific to the Recruiting module.

The system does not provide a record of all emails sent to a contractor through the system. If a contractor asks for example, "What bid request?", employees are unable to see a list of notifications they have received in order to help them find it, or even to confirm if the system properly sent it.

The system does not have an ability to easily globally search for contractors by their phone number or email. Contractors and clients often forget to include their business name and location when they send emails and leave voicemails, so employees need to be able to identify them using only a phone number or email. Currently, a report must be generated to filter by this common data, but waiting for the report to generate slowly becomes time-consuming when this occurs multiple times per day.

When new contractor profiles are created, one must choose from a list of services provided (service categories) so the system can recognize what jobs the contractor qualifies for. Currently, however, each time a service category is selected, the dropdown menu disappears, forcing you to open it back up and scroll through it again to simply add another service category. It thus inefficiently takes several minutes to perform a simple task of adding a dozen or so service categories to a profile.

The Recruiting module in particular is very inefficient, cumbersome, and lacking several important functionalities. Firstly, the Recruiting module does not consolidate frequently-needed information in a single tab. In order to obtain information about which contractors are in the area, who has already been contacted, bids you have received, contractors who rejected the job, conversation notes, etc., Recruiters must navigate between four different tabs. It is inefficient and frustrating, especially when Recruiters may be working on hundreds of jobs but don't have quick access to all job data in one place.

If a job is added back to the Recruiting Search Report<sup>2</sup> (because the first contractor was fired or quit), the job appears as a new job on the Search Report without any of the previous notes from the last time it was recruited on. The Recruiter cannot simply continue where they last left off, but must go through some loops to find their old notes. This means a Recruiter must filter for previous jobs at this location on their Search Report, then navigate through its multiple tabs simply to find important information on backup contractors or other important notes. This slow access to old Recruiting notes doesn't even occur if the Recruiter was not able to recognize that this is a repeat job in the first place since the system does not tell them this.

The Recruiting module has a Notes tab, but it does not work in a way that is needed for Recruiters to keep notes on a job properly. Currently, you simply add or edit a note. The notes are barely visible, require scrolling to scan them, and they cannot be filtered or sorted by pertinent information because all notes are limited to a single large field without rows that separate different information on them.

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<sup>2</sup> The Search Report is a listing of all jobs currently uncovered, which the Recruiters work off of daily.

Recruiters talk to dozens of contractors daily and must be able to notate a plethora of conversational notes such as when they are visiting the site, their bid amount, when they can do the job, the number they want called back at, concerns they have, questions they need answers to, etc. Difficult jobs commonly require calling hundreds of contractors, and Recruiters need a way to detect duplicate phone numbers to avoid calling the same contractor twice when calling down lists.

Consequently, Recruiters tend to use a supplemental spreadsheet for each job, which easily accumulates into hundreds of spreadsheets per Recruiter. The spreadsheet places all information in a single place, at the tip of their fingertips, a “detect duplicate” filter can prevent repeat calls, and they can filter by specific custom rows like ‘Bids Received’ or ‘Follow Up Date’. While necessary to do their job, this results in a large amount of data that is kept personally and not integrated with the enterprise system, nor easily accessible by other employees who may need it, which is especially troublesome when another Recruiter must help on that job.

When there are multiple jobs for a single client store, these are listed on the Search Report separately, and each selected contractor can only receive one email bid request for each job. Stores commonly have multiple services that can be handled by the same crew, which results in contractors receiving three to eight emails for a single store. Contractors willing to tolerate a spam-like notification system are still confused about which ones to click to submit bids.

Furthermore, the system does not allow you to increase or decrease a service area (miles radius) for individual contractors. Contractors often vary in how far they are willing to travel. Currently, the system only shows contractors within a 60 mile radius, and a Recruiter

may send a bid request to each of them. This results in some contractors receiving unnecessary bid requests who travel only short distances, who may complain that they don't want bid requests that far out, while others are never contacted in the first place who were a little over 60 miles away but do travel farther out. This leads to inaccurate use of data, slows down the Recruiting process, and worst of all can result in overlooked contractors.

The system does not visually display, like a map, Recruiting jobs. When contractors frequently call to ask about work in their area, it is difficult for Recruiters to get a quick answer to them, having to filter by their state and then ask the contractor which of the job cities are near them. This is time-consuming and inefficient. This is also important as Recruiters often need to visually understand the store's location for communication and organizational purposes.

The system does not allow jobs on the Recruiting Search Report to be assigned to contractors if they do not have a max bid and billing amount on them. Every time a job for a new client, or new type of job for a current client, is sent to the Search Report, the max bid and billing amount is automatically zero because a bid from the contractor must be obtained to determine the client billing amount. Recruiters can't work on the job without it being sent like this, but then the job must be canceled and resent to the Search Report after obtaining the billing amount. This is inefficient and cumbersome on both Customer Service and Recruiting.

When a Customer Service Manager cancels a job on the Recruiting Search Report, the assigned Recruiter is not notified by the system. This results in them accidentally continuing to work on a job that's been canceled, and/or continuing conversations with a contractor who can't take the job now anyways.

Moreover, <CleanCrew National>'s IT does not properly enable the Recruiting Process. It's inefficiency and lack of important features slow down the Recruiting process dramatically. These issues combined, especially with hundreds of jobs per Recruiter, are wasting the company thousands of dollars per year as Recruiters work a rate much slower than the enterprise system could enable. The Recruiting module is so stressful to work with that over the past several years <CleanCrew National> has been not been able to hire a new Recruiter that stayed longer than one month. The issues of the Recruiting module warrant strong attention as one of our highest priorities to resolve, because successful recruitment of the right people is one of the most important parts of an organization (Sherzay 2015). As a core and time-consuming business process, having a good and streamlined recruitment process is essential for saving time and working efficiently (Sherzay 2015).

## **Analysis of Business Processes Issues**

The business processes of Document Submission and Document Processing are currently cumbersome and prone to various issues, some leading to serious information loss and loss of contractors due to frustration.

Contractors are required to submit several documents, primarily including the MSA (Master Service Agreement), insurance certificates, completed Work Orders, and invoices. For reasons of legibility and professionalism, <CleanCrew National> policy requires that documents are either a) faxed or b) scanned then emailed. Consequently, contractors must have frequent access to a working computer and/or fax machine. For a contractor that completes Work Orders and creates invoices on a regular basis, this quickly becomes cumbersome and leads to contractors that eventually quit. With their money at stake, contractors frequently call

<CleanCrew National> to confirm that emailed/faxed documents were indeed received. This results not only in more time on their part, but the valuable time of <CleanCrew National> employees being wasted in confirming that documents were received simply because the system does not issue automated confirmation of document receipt.

Furthermore, a contractor confirming with a single individual that a particular document was received does not communicate if all required documents have been submitted. For example, a contractor might be able to confirm with, say, a Customer Service Manager, that their Work Order and invoice were received but was not made aware that they are missing updated insurance documents required to issue payment. The system not only does not automatically confirm received documents, but it also does not inform contractors of other required missing documents that should have been bundled with it—such as before and after pictures required on special jobs. Combined with the slow Document Processing on <CleanCrew National>'s part, to be discussed next, this issue has escalated into one of the most common reasons that contractors quit <CleanCrew National>. Any contractors that quit costs <CleanCrew National> hundreds of dollars in the total employee time involved in finding and onboarding new contractors.

Document Submission is not only cumbersome to contractors, but Document Processing by <CleanCrew National> employees has several issues too. In the current process, all submitted documents are first sorted by the Receptionist to their appropriate department, then each department is responsible for processing documents belonging to their queue. The largest issue is that submitted documents are often difficult to identify due to missing information, poor handwriting, and/or typos. While some documents may be fast to process, others take

several minutes merely to figure out a single piece of information about it, such as which company submitted it, the correct Work Order number, the correct invoice number, what client store it is for, etc. In some rare cases, a document is not identifiable at all—resulting in a frustrated contractor when they may, days or weeks later, inquire about it. The most common issue is missing Work Order numbers. Because Work Order numbers appear at the very top of Work Orders, fax machines often cut off the very top portion, resulting in an unreadable number for us.

Any standalone pictures submitted without descriptions are impossible to identify. With thousands of clients, submitted pictures that do not say which client store they are pictures of, or what Work Order they may be part of, simply can't be identified. The Receptionist thus forwards them to the Customer Service Queue where they are never processed. Sometimes vendors include a separate page with their submitted documents that explains what the documents are for. However, the Receptionist can only send it alongside other documents to a single queue, meaning one department may still be confused.

Even after documents are identified, processing them is not fast and easy. Each department's employees must go through several steps to manually tell the system the contractor, store, Work Order, and/or invoice that a particular document is associated with. The Recruiters and <Vendor Qualifications Manager> have several steps required to tell the system about a new document, for example, entering insurance policy information manually, then attaching the insurance certificate document to the entry. Many of these processing steps could be easily automated if contractors were able to, through some technological means, provide this information when submitting documents. Altogether, the process is slow,



inefficient, and some documents are never processed. It takes too long to inform a contractor that a submitted document must be resubmitted (e.g., missing signature, incorrect information, etc.)—something that should be informed about within 24 hours instead of several days.

Furthermore, the <Vendor Qualifications Manager>'s primary tasks of notifying contractors of missing core documents is a highly inefficient and error-prone task that could easily be automated. Currently, the <Vendor Qualifications Manager> must run several different reports, of which each is slow, that tell him only a single piece of information such as vendors who are due for payment, vendors who are missing insurance, vendors who are missing MSAs, etc. The provided data must be merged in an Excel document then use a “detect duplicates” filter to simply get the information we really need: vendors who are actively working that are missing core documents. Finally, the <Vendor Qualifications Manager> must manually email these contractors informing them what they need. All of this is highly time-consuming and prone to human error, and could easily be automated.

Finally, when the Vendor Compliance needs a vendor packet (for new contractors), those one-time documents are the most cumbersome for contractors to submit. These include a very lengthy Master Service Agreement (MSA) that must be filled out in multiple areas, initialed on multiple pages, and signed at the end. Scanning and faxing its eight pages is very burdensome on contractors. This document is almost never completed correctly the first attempt or two, as fields are often skipped or filled out incorrectly, information and signature in wrong places, etc. This makes it that much more burdensome when asking them to resubmit it correctly yet again, but it usually takes contractors three attempts to do it correctly. This issue cannot be ignored because the burden on contractors to complete, sign, scan, and email this

vendor packet, especially more than once, is a primary reason contractors refuse to join in the first place.

The issues above must be addressed for the successful longevity of the company.

Document processing challenges are actually a common issue among organizations; the International Data Corporation found that, on average, organizations waste \$20,000 a year *per worker* due to document challenges (Blue Technologies 2018). It is imperative that our workflow in document processing is automated in an accurate and reliable manner to save valuable employee time (Blue Technologies 2018).

## **Analysis of Information & Knowledge Issues**

<CleanCrew National> currently has undocumented core business knowledge. There is crucial business knowledge that resides only in the minds of the CEO, President, and Operations Manager. Should any of them leave the company for any reason, this could be devastating to the company if their crucial business knowledge remains undocumented. Theoretically, the CEO could choose to replace the President for example, and the CEO or Operations Manager could retire soon since both are near retirement age. The risk of losing crucial business knowledge is thus very plausible.

It could be easy to mistakenly think that proper knowledge management is only important for larger companies and ignore the issue presented here. On the contrary, in a study of knowledge management across all companies, the authors of *Knowledge Management in Small and Medium Enterprises* found that knowledge management is actually more crucial for smaller enterprises because they are more subject to employee turnover, acquisition, and layoffs (Ansari et al. 2009, 5). This means that smaller companies, such as <CleanCrew National>,

face a higher risk of knowledge loss that management is unable to prevent without capturing business knowledge beforehand (Ansari et al. 2009, 5).

There is particularly heavy dependence on the Operations Manager across all departments for undocumented business knowledge related to questions about cleaning instructions, equipment information, and chemical usage that frequently comes up. If this knowledge were documented, it not only reduces the risk of losing it, but it would allow employees to access this information without having to frequently query the Operations Manager.

Furthermore, when the Operations Manager is queried on a daily basis, this consumes worktime on both his part and the inquiring employee. Not only does this waste time on the clock, but it also delays business processes that require those answers. For example, a Recruiter might wait 1-2 days for the Operations Manager to return from a business trip to answer simple contractor questions about cleaning a particular floor type and then wait further hours or days before they can reach that contractor again to inform them.

Finally, while <CleanCrew National> underwent efforts to create training documents for several employee positions, they are not consolidated or managed properly. They are not all kept in the same place for convenient access and any employee is able to edit (and thus tamper with) them.

For reasons of risk of losing crucial business knowledge, wasted work time in daily queries, delayed business processes, and unmanaged training documents, <CleanCrew National> is at risk, and wastes company dollars, in the area of Information & Knowledge.

## **Analysis of Controls/Metrics Issues**

<CleanCrew National> is lacking methods for preventing misconduct in the area of Document Processing. Currently, anyone can access, process, or delete any document in the Document Queue. This includes the filter views of the Receptionist and all view filters specific to individual departments.

While auditing trails do exist to identify employee misconduct, they only work partially and the system does not prevent tampering with documents in the first place. Firstly, the auditing trails do not currently work for employees who process documents through the queue. The auditing trails only show the person who processed a document if they manually (directly) uploaded it. The majority of documents are processed through the Documents queue however, making the auditing trails useless; the person who processed it wrong cannot be identified.

Having working audit trails is essential for ensuring the integrity of data, with a multitude of potential risks otherwise including financial loss, credibility loss, loss of customers, inability to function efficiently, growth hindrance, and violation of legal regulations (Roratto et al. 2014, 2). In their study on audit trails published in the Journal of Information Systems and Technology Management, Rodrigo Roratto and Evandro Dias further explained that audit trails must exist to minimize vulnerabilities and risks and check controls (Roratto et al. 2014, 2). In fact, the first concern of any experienced attacker is whether or not the audit trail will detect them (Roratto et al. 2014, 2). As such, any malicious <CleanCrew National> employees aware of our current security flaw are quite free to exploit the system without risk of detection.

However, even if the auditing trails were fixed, <CleanCrew National> still lacks complementary preventative measures as well. Auditing trails can be useful for monitoring

employee activity, and for managers for to correct and discipline those identified as misprocessing something, but <CleanCrew National> also needs preventative measures. Currently, employees are not restricted to their own departmental queues and thus can cause any number of potential damages before being caught. For example, a disgruntled employee could manipulate any number of documents for malicious reasons and the issue would not be corrected until realized. Even worse, auditing trails don't work at all for deleted documents. Theoretically, any employee could delete any document either for malicious reasons or by mistake (thinking the document wasn't needed) and no one would ever know. Simply put, employees are not restricted in what they are able to access and manipulate.

<CleanCrew National> has experienced multiple occasions of needing to correct an employee misprocessing documents as well as problems identifying rogue employees. Although <CleanCrew National> has not experienced very serious document tampering *yet*, the potential for harm exists with no preventative measures in the areas of control metrics.

## **Analysis of Data Issues**

The final area of analysis regards data issues. There is unintegrated data, duplicated data, and difficulties with organization names that slow and hinder business processes.

Although most of <CleanCrew National>'s relevant data is integrated into the enterprise system where all departments can access it, some data is still unintegrated. Employees in every department, sometimes openly or secretly, keep personal spreadsheets to help them keep track of information because the current enterprise system lacks ways to properly document this information. Such data includes spreadsheets containing recruiting notes, QA checklists, billing notes, chemical information, etc.

<CleanCrew National>'s Unification operating model (Ross et al. 2006, 61-62) means that its departments are very interdependent on each other and must utilize the same data for everyday operations. Consequently, any unintegrated data hinders efficiency and communication, if not fully halting some business processes. Emailing such data around when requested is a common work-around solution, this comes at the risk of potential data loss or corruption as employees send back modified spreadsheets/documents to each other and different employees now have different versions of the same spreadsheets or documents.

It is important that such data is integrated into the enterprise system in order to make it easily accessible and less prone to corruption, which would require some redesign. Figure 2 of the Appendix is a Role/System Matrix, reflecting the relational dependencies between our application components and the business roles which use them (The Open Group 2009, 33). This gives a visual understanding of our interdependencies to highlight our need for stronger integration.

Currently there is no ability to rename or delete organizations. The reasoning for this is somewhat understandable: just because we are no longer using a company, even if they permanently shut down, we still want to maintain those records and not delete them. We would not want to risk unforeseen consequences by deleting a company record that could be needed down the road. The main reason for preventing company renames is because Accounting uses an unintegrated application, QuickBooks<sup>®3</sup>, that would not automatically be updated to reflect such a change and cause confusion to Accounting. A lesser reason we may

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<sup>3</sup> QuickBooks is a trademark of Intuit Inc., registered in the United States and other countries.

not want to rename a company is because it could cause confusion to other departments that no longer recognize the company.

Nonetheless, there are still troublesome scenarios. When contractors rename their business, we have to create a new profile for them since we can't rename the current profile. Some companies have been bought out multiple times, resulting in 3-4 different profiles for the same cleaning crew (one being the current profile, the others old ones). Furthermore, any time the <Vendor Qualifications Manager> or a Recruiter make a typo in a company's name, they can't fix it. Either everyone must become aware of the mistake to intentionally misspell the name every time they need to find the company, or they must make a new profile for them. In this case, there is no reason to maintain a permanent record of a company profile that is brand new and completely unused. Yet it can't be deleted, and now there are multiple profiles with similar names. Even the best spellers make typos—such mistakes are inevitable—so the solution can never be purely rooted in avoiding typos.

Duplicate data, such as for clients, is one of the most common “bad data” problems in databases (Coles 2017). QGate, a CRM and BI consulting company, explains that duplicate customer data is actually a very high priority to resolve in a company. Issues with duplicate customer data, relevant to our situation, includes: hindered communication, inefficient communication gives the company a bad reputation, inability to quickly find the correct record creates poor customer service, work inefficiency, decreased user adoption, inaccurate reporting, and hindered business processes (Emery 2017).

These issues combined together has resulted in several dozens of excess profiles. It causes confusion when trying to navigate to a contractor's correct or current profile, and delays

the time it takes to get there because of first ignoring which ones are incorrect. Profiles can be set to inactive so they do not appear as an option for available jobs in the Recruiting module, but the Organizations module does not have a filter for excluding inactive profiles. This has resulted in several employees wasting several minutes every day as they click each profile one at a time to see which one is the correct (active) one. It is also not uncommon that employees accidentally update the wrong profile since inactive profiles can still be updated, leading to further issues. Besides creating inefficient and error-prone processes, the database is likewise being cluttered with multiple profiles, consuming more memory and slowing data queries.

## **Recommended Solutions & Conclusion**

Solutions for the above analyzed issues will be provided here, including alternative solutions considered. After listing all solutions, they will be summarized followed by recommended next steps and a high-level roadmap in the Conclusion subsection.

### **Recommended Solutions for Information Technology Issues**

In order to resolve the inefficient and cumbersome issues with the current enterprise system, redesign in some specific areas is recommended. The costs are justified, since it will strongly improve efficiency and enable core business processes the current system doesn't.

Six simple redesigns include: 1) System to show a record of all emails sent to any contractor, shown in a new tab at their profile. This will allow employees to better communicate with contractors and confirm if the system properly sent out a notification. 2) Global filtering by contractor phone number and email. This will allow all employees to easily



identify contractors, saving large amounts of time wasted on this simple task by using the cumbersome report generator. 3) Service categories added to a new profile to be a sticky select menu, allowing you to select multiple services at one time before submitting all of them. This will make the task of listing service categories for a contractor take a matter of seconds instead of minutes. 4) The system must allow Recruiters to set the mile radius of each contractor's given service area on their profiles. This will ensure the proper contractors are contacted for available jobs. 5) The system should send a notification to the assigned Recruiter when jobs are canceled off of the Search Report. This will ensure no time is wasted recruiting on canceled jobs. 6) The system must allow Customer Service to update the billing amount and max bid of jobs already on the service report. This will result in no longer having to cancel, re-send, and re-assign jobs simply to award it to the contractor already chosen.

The Recruiting module must be redesigned entirely to allow Recruiters to do their job properly and efficiently. The new interface must be more akin to a spreadsheet—the most pertinent information should be shown on a single tab, including contractors, contractor status, contractor contact information, and bids received. This will give Recruiters fast access to pertinent information whenever it is needed. It should also allow Recruiters to manually enter information on companies not yet in the system officially (such as someone they left a voicemail for) with the ability to detect duplicate phone numbers. This will ensure all contacted crews are viewable in the same place, and the duplicate phone number detection will prevent calling the same crew accidentally when searching outside the system.

Notes would need to be on a separate tab due to limited space, but they must be sortable and filterable by information that Recruiters rely on the most for relevance, including

contractor name, status, last contact date, and follow up date. The notes must have generous space to resolve the issue of being formerly unreadable.

If a job is added back to the Search Report, it must indicate that it is a bounce-back job with a convenient hot link to the previous listings of it on the Search Report. This will enable Recruiters to access their previous Recruiting notes and essentially continue where they last left off.

Multiple jobs for a single location should be bundled into a single email (bid request) sent to contractors. This will cause contractors to be much less annoyed in comparison to the current spam-like system and will reduce the number of emails going to their spam folder. It will also consolidate all the job information making it easier to understand and communicate the details, and it will prevent time from being wasted where Recruiters are simply trying to explain job information that contractors could not or were unwilling to dig up.

The Recruiting module should include a new Map tab that will visually display, like a map, available Recruiting jobs. This will enable Recruiters to have a proper understanding of their location, to allow them to properly communicate with each other and contractors about available jobs, including services that could be bundled together in the same route.

Moreover, these above changes will drastically improve the efficiency of the Recruiting process, as well as consolidate all Recruiting information into the system, thus removing the need for Recruiters to rely on personal spreadsheets that are not integrated with the system.

### **Alternatives Considered**

Alternatives existed for some of the recommended solutions above. Improving the report generated that allows filtering by contractor data could make this process faster, but it

does not fix the root issue and would be less efficient than direct global filtering. Requiring Customer Service to notify Recruiters by email about cancelled jobs would keep Recruiters updated, but the reliance on remembering to do this, instead of automated, means it wouldn't always happen.

Making partial changes to the Recruiting module, instead of complete redesign, would only increase efficiency marginally because full redesign would be needed to drastically improve and fully enable the Recruiting process.

Instead of paying to add a visual map display of jobs to the Recruiting module, <CleanCrew National> could integrate a fast mapping application with the current enterprise system. This, however, is less efficient and requires more total software on the employee computer.

## **Recommended Solutions for Business Processes Issues**

The recommended solution to the aforementioned business process issues is the creation and implementation of a robust Vendor Portal system, alongside some minor redesign with Work Order generation and the Organizations module. Vendor Portals are a powerful management solution with multiple excellent benefits for vendor issues. Lavante, an industry-leader SaaS supplier, explains that Vendor Portals bring the following benefits relevant to our company: automated supplier onboarding, process automation, data syndication, and effective invoicing procurement (Flynn 2016). For clarification, although our SaaS provider for our enterprise system already provides Vendor Portals, <Cleaner's SOA> did not have a Vendor Portal that meets <CleanCrew National>'s unique business needs and thus <CleanCrew

National> must understand its own design requirements for having its own Vendor Portal programmed.

A Vendor Portal will powerfully resolve all of the aforementioned issues with our Document Submission and Document Processing. The Vendor Portal will allow contractors to directly upload/submit their documents through the Vendor Portal. Upon login, the Vendor Portal will display assigned jobs and their profile, so the contractor can upload documents to the appropriate job (Work Orders, etc.) and to their profile (updated insurance, etc.). It will be conveniently accessible as both a desktop and mobile application.

This means that <CleanCrew National> employees no longer have to waste considerable time sorting documents or trying to figure out which job or client store they belong to. Further time is also saved because information no longer needs entered about the items, because the Vendor Portal can require the contractor to enter that (such as insurance coverage amount). Missing information and poor legibility no longer result in further processing delays. Standalone pictures, which were formerly impossible to identify, are now directly uploaded by the contractor the store they belong to (chosen from his list of assigned jobs). Documents missing information needed to identify them, such as Work Order or invoice number, can still be identified now they are they are uploaded exactly where they belong.

It is still recommended, however, that the location of the Work Order number on generated Work Orders are moved away from the top so they are readable, since fax machines tend to cut off the top portion. Although the Vendor Portal allows unreadable documents to be uploaded to the correct place anyways, it would be a hindrance when reading and verifying submitted Work Orders.

The Vendor Portal will immediately confirm successful uploads, thus saving time where contractors currently call <CleanCrew National> frequently simply to confirm documents were received. Related, when uploading documents, the Vendor Portal will notify them of missing other documents. Such as, when uploading a Work Order to a job that requires before and after pictures, it alerts them that pictures are still needed.

Because the Vendor Portal has documents automatically attached to the appropriate profile or job, with requested information manually entered by the contractor where it can't be automated, processing by <CleanCrew National> employees is fast and easy. Employees will, of course, still have to confirm that the submitted documents meet requirements (have a valid signature, correct invoice number, valid insurance, etc.). However, the time-savings will still be immense. Employees would simply need to view a queue displaying documents in need of verification; the documents themselves no longer need sorted or other information entered, only a click of a button to confirm or deny. Denied documents should allow employees to send an email reply directly to the contractor about the reason for rejection if there is something wrong.

Even better, the Vendor Portal system will also efficiently automate tasks currently performed by the <Vendor Qualifications Manager>. The Vendor Portal will know from the system what working contractors are missing exactly, then automatically email them about those missing documents weekly. These notifications will be viewable from contractor profiles (part of the IT Solutions previously listed) so that the <Vendor Qualifications Manager> and others can confirm to contractors that they received these notifications and when. Because some contractors prefer a text message, or may not even have an email, options should be

available for the notifications to be sent by email, text, or both. The <Vendor Qualifications Manager> and Recruiters should be able to, with the click of a button, send a manual reminder as well about missing documents too with a customizable message.

Finally, for new contractors needing to complete the vendor packet, the vendor packet will be able to be completed and signed digitally directly in the portal. A custom program will be needed to allow completing the forms and signatures digitally. By requiring completion of fields, contractors won't be able to accidentally skip a field. With help text, contractors will be less confused about what to write down. With digital fields and signatures, contractors will not have to print, scan, or email anything. This will be tremendously convenient to contractors and save drastic work time for the <Vendor Qualifications Manager>.

Figure 3 of the Appendix is a System Use Case Diagram representing the actors and use cases of the proposed Vendor Portal (The Open Group 2009, 39). It is clear from the several benefits listed that a Vendor Portal would be an excellent investment for <CleanCrew National>. Regarding monetary considerations, a high ROI is listed as one of the best benefits of Vendor Portals (ICG Consulting 2018).

### **Alternatives Considered**

There are no alternatives that match the power of the Vendor Portal in resolving all of the Business Process issues. Contractors are already advised about how to properly submit documents and this does not prevent missing information that makes them slow to identify and process. The system could automatically send confirmation of receipt by replying to the source of received documents, but this would only work for emailed documents and not the vast amount sent via fax. Hiring more employees to help with document sorting and processing is

not a viable option because it is not a justifiable cost, and there is not enough work outside of document processing to justify their hire.

An alternative to the Vendor Portal including a digital vendor packet and automated notifications of missing documents would be to have the <Vendor Qualifications Manager> use an electronic signature application and mass-email application. However, these options have already been explored and rejected. I, the author, have personally tested over eight electronic signature applications and found them implausible. Besides critical design issues, these programs are expensive (hundreds of dollars per year with limited users) and have an annual limit of documents that can be sent, which is easily exceeded by us since thousands are sent annually. Some of these include options of charging our account per document sent by as low as 10 cents each, but this still results in unjustified costs of several hundred dollars annually. Furthermore, most of these programs include confusing spam-like ads to their other products, causing them to appear as spam email.

## **Recommended Solutions for Information & Knowledge Issues**

<CleanCrew National> technically has a rudimentary knowledge management “system” in the sense that various training documents explaining business processes have already been created and publicly shared. However, as discussed previously, core business knowledge remains undocumented regarding the CEO, President, and Operations Manager. It is recommended that the company adopt an official knowledge management system, deploy current knowledge to it, and thoroughly document all remaining core business knowledge in it. This will drastically reduce the risks associated with losing such core business knowledge should any of the aforementioned key figures leave for any reason. It will also save considerable time

on a daily basis by allowing employees to access the documented knowledge of the Operations Manager instead of constantly querying him with common questions. An official knowledge management system will allow fast and easy access, search queries, and reports, all in a secure manner.

As our knowledge management system is expanded and properly maintained, studies have shown that small businesses like <CleanCrew National> will minimize risk of knowledge loss and allow efficient knowledge sharing (Ansari et al. 2009, 5). Although reducing risk of knowledge loss is the primary goal, another benefit of expanding our knowledge management is its aide in successful innovations, as it allows studying customer/client needs and current business processes to find creative business solutions (Ansari et al. 2009, 6). Figure 4 of the Appendix shows a To-Be High-Level Knowledge Management Diagram, modeling which specific data, information, and knowledge to document and their benefits (Bernard 2012, 300).

### **Alternatives Considered**

The only alternative to using quality Knowledge Management tools would be to document our business knowledge using our current method of simply using Microsoft Word documents. That may suffice for training documents, but it will become increasingly unmanageable as more and more information is added, especially complex information unsuitable for Word documents. This method also does not have tools empowering employees to run convenient queries for pertinent information, and it does not allow data mining, reporting, or other intelligent analysis tools. Finally, using word documents is less secure since they are easily accessible and editable.



## **Recommended Solutions for Controls/Metrics Issues**

It is recommended that <CleanCrew National> implement security controls and metrics to prevent document tampering and proper auditing trails to identify to source of any issues. The root issue to be addressed first is the current freedom for any employee to edit and even delete any document. The first recommended step is to implement authorization protocols so that employees are restricted to only be able to edit documents specific to their department. This prevents employees from meddling with documents they shouldn't be in the first place, whether they were trying to help or had malicious intent. This requires the aforementioned Vendor Portal where contractors classify their own documents upon submission, because the system cannot otherwise compartmentalize them by default in order to allow this restriction.

Regarding the potential deleting of vital documents, this issue has not yet occurred and it would be too inconvenient on employees to remove this ability considering how unnecessary documents do need deleted frequently (such as deleting a document you uploaded to the wrong place by accident). However, the auditing trails should detail any time a document is deleted, so that in the rare and hypothetical case of such an issue, the culprit can at least be identified.

Finally, the auditing trails must be fixed to always display the employee responsible no matter how they are processed. Having auditing trails which do not work for documents processed through the Documents module is completely unacceptable, and strains the company every time a document is misprocessed.

### **Alternatives Considered**

There are no other acceptable alternatives, other than ignoring the problem and doing nothing. Because the enterprise system used is designed with SOA principles, these changes will be affordable and simple. Ignoring the issue is not acceptable, as it only allows serious potential damages.

## **Recommended Solutions for Data Issues**

In order to resolve the issues related to unintegrated and duplicate data, some redesign and minor changes to the current enterprise system is recommended to resolve the issues at their root. <CleanCrew National>'s Unification model encompassing strong dependence on the same data creates a priority to keep all relevant data integrated into the enterprise system. In order to integrate the remaining bits of unintegrated data, redesign of the modules each department works in will be needed.

Because most department employees track information manually using Excel spreadsheets with some efficiency, it is recommended that a spreadsheet-like tab is implemented for each department in their main module, where each employee can only access their own logs. This will allow employees to track information efficiently as they do so now, but keeping the data integrated directly to the system and viewable by all. By disallowing employees from editing other employee's logs, we can also ensure security of such notes. Overall, this will ensure all data is tightly integrated and accessible at all times, and less prone to corruption compared to the current employee methods discussed earlier.

It is recommended that the enterprise system's control metrics are changed to allow renaming of organizations. Because typos cannot be prevented, and many companies undergo name changes (some even multiple times), it creates too much strain and potential for

confusion and damage when employees must create a brand new profile. In order to prevent department confusion regarding new company names, it is recommended that any change to an organization's name send a global notification to alert <CleanCrew National> employees. Secondly, a box should appear on the main profile page of each organization listing former business names. With these two methods combined, we can ensure that confusion about new company names is minimal.

Organizations should not be able to be deleted indeed due to the importance of keeping permanent records of all contractors. However, it is recommended that the Organizations module include a filter (enabled by default) that excludes inactive profiles from searches. This will save large amounts of time and prevent confusion when employees are trying to look up a contractor since it will no longer display those companies when searching. Secondly, it is recommended to implement a new control metric wherein inactive profiles cannot be edited until they are reactivated. This will prevent the common mistake of accidentally updating a wrong or old profile to ensure employees are better redirected to correct profiles.

### **Alternatives Considered**

A similar but alternative solution could be the same as above except *not* allowing renaming of organizations. By implementing the filter for excluding inactive profiles and not allowing inactive profiles to be edited until reactivated, it would still reduce the amount of time wasted and confusion generated with identifying and updating the correct profile. However, if profiles cannot be renamed, considerable time is still wasted in the several steps it takes to deactivate a profile and create a new one, and this method does not allow automated notifications of a

company name change. The first solution above is deemed superior because it maximizes efficiency and minimizes confusion.

## **Conclusion**

The issues in <CleanCrew National>'s IT, Business Process, Information & Knowledge, Controls/Metrics, and Data areas are all resolvable with the aforementioned redesigns to the enterprise system. Many of these are minor changes (quick and affordable), while others are larger changes but still strongly justified. In applying these solutions, I suggest beginning a systematic approach of their implementation—broken down into different stages where different system changes are spaced apart. This reduces risk, as making all changes at once, on the other hand, would present greater risks if multiple system bugs and incompatibles co-existed.

For the larger changes, it is recommended to have a “Preparation” and “Post-Assessment” stages to minimize risk. These will ensure quality through prior thorough documentation of requirements and allow time for bug fixes and minor needed redesigns for any overlooked areas. Minor system changes, on the other hand, can be bundled together and several implemented all at once since they are extremely unlikely to have any unexpected consequences. These do not require a “Preparation” stage since the simple changes needed are understood exactly and are ready for submission to the programming team.

Figure 5 of the Appendix is a high-level roadmap providing an overview of the recommended next steps to improve the EA (Bieberstein et al. 2005) as it transitions to the future IT state (Bente et al. 2012, 83). It provides a concise and simple summary of the changes to be implemented, without the details of their aforementioned benefits and justification.

Where issues and solutions were formerly discussed by order of category, the phases of the roadmap have been organized by tasks of highest priority.

As we enter Phase 1 of this roadmap, we will begin our road to better business-IT alignment. The benefits, in summary, entail end results of IT efficiency, business processes enabled through IT, improved contractor relationships, tremendous time savings through automation and the Vendor Portal, reduced IT risks, and security.

## Appendix

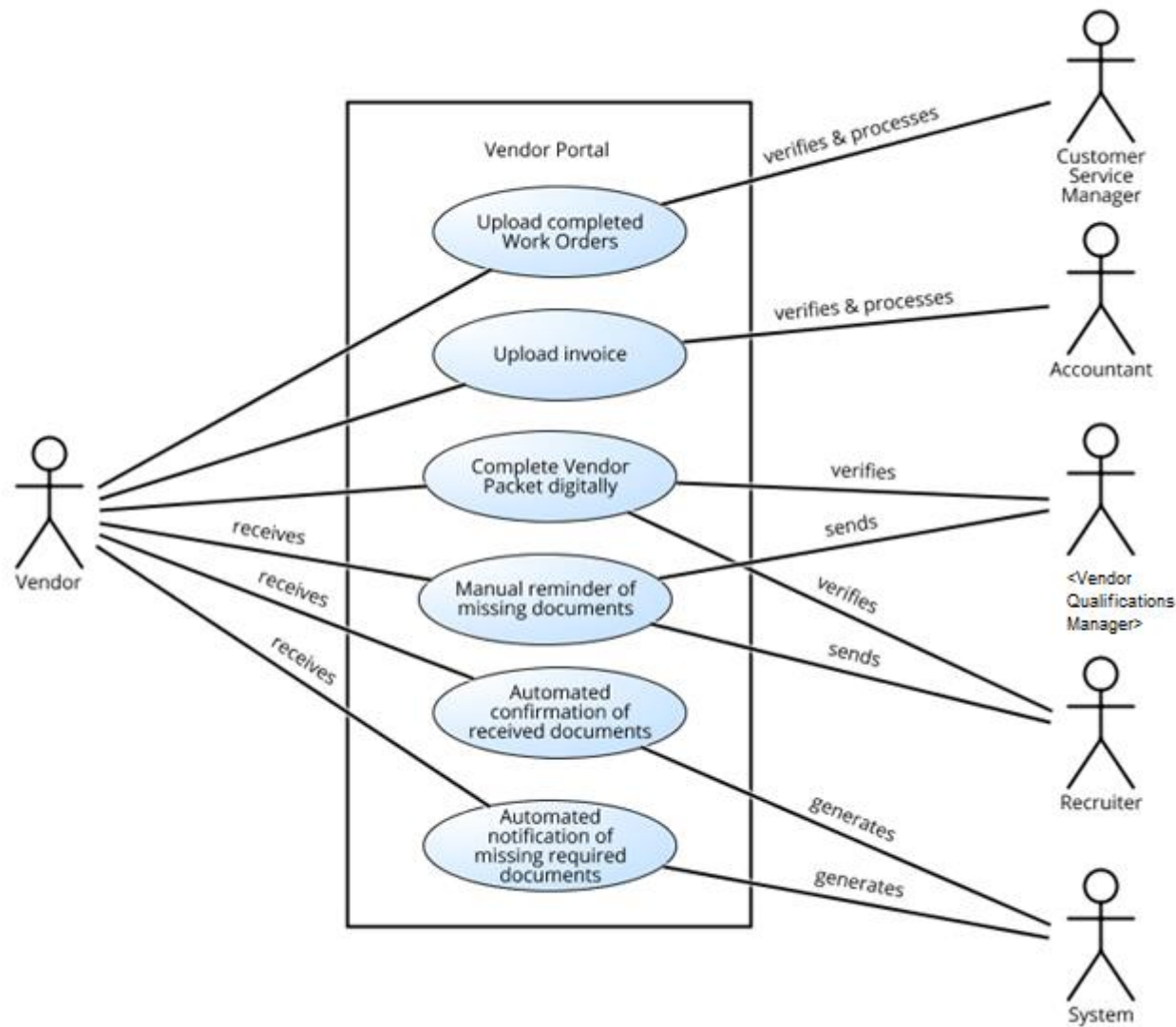
**Figure 1 – Business Interaction Matrix**

	<b>Providing Business Services</b>				
<b>Consuming Business Services</b>	<i>Sales</i>	<i>Recruiting</i>	<i>Logistics</i>	<i>Customer Service</i>	<i>Accounting</i>
<i>Sales</i>					
<i>Recruiting</i>	Contract for new client services			Client requests, bid estimates for new services, request for contractor labor to fix QA issues	Request for required contractor documents (W9, MSA, etc.), confirmation of services paid
<i>Logistics</i>		Shipping materials for contractor jobs (contractor-kept)		Shipping materials for contractor jobs (store-kept)	Mailing of checks
<i>Customer Service</i>	Onboard new clients	Work Order fulfillment to standards			
<i>Accounting</i>	Create billing data	Payment for contractor labor	Charge contractors for shipping materials	Charge for services rendered	

**Figure 2 – Role/System Matrix**

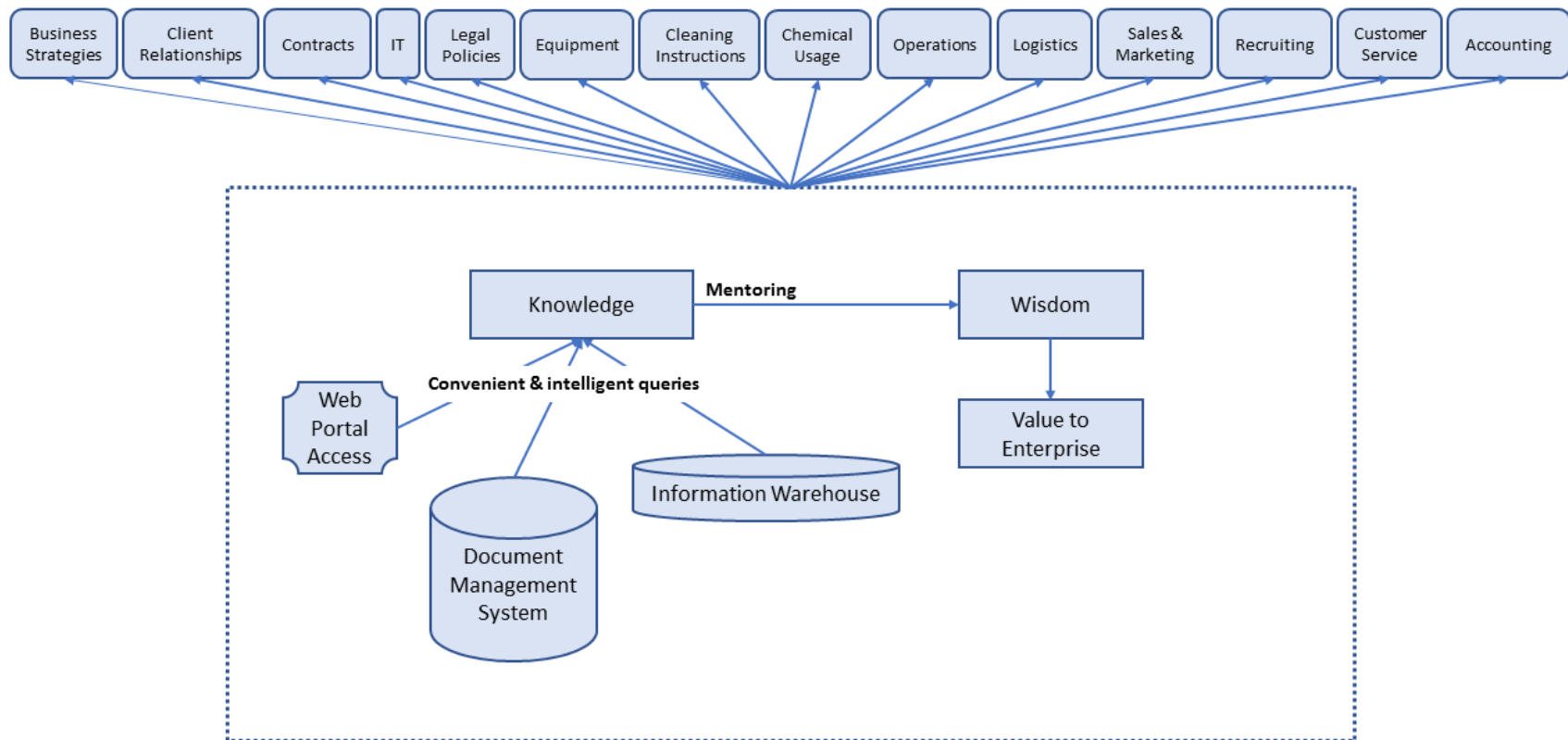
APPLICATION COMPONENT (Y-AXIS) AND BUSINESS ROLES (X-AXIS)	SALES	RECRUITING	LOGISTICS	CUSTOMER SERVICE	ACCOUNTING
WORK ORDERS MODULE	X			X	X
DOCUMENTS MODULE	X	X	X	X	X
INVOICES MODULE	X	X		X	X
SALES MODULE	X				
ORGANIZATIONS MODULE	X	X	X	X	X
LOCATIONS MODULE	X	X	X	X	X
REPORTS MODULE	X	X	X	X	X
RECRUITING MODULE		X			
CLIENTS MODULE	X		X	X	X

**Figure 3 – System Use Case Diagram**





**Figure 4 – High-Level Knowledge Management Diagram**



**Figure 5 – High-Level Roadmap**

Phase	Est. Timeline	Tasks
<b>Phase 1 – Preparation for Recruiting Module Changes</b>	6-10 weeks	<ul style="list-style-type: none"> <li>• President to discuss with Recruiters requirements needed</li> <li>• Design and proto-test new interface with Recruiting team</li> <li>• Submit design for programming, wait for completion</li> </ul>
<b>Phase 2 – Implement New Recruiting Module</b>	1-2 weeks	<ul style="list-style-type: none"> <li>• Implement redesign of Recruiting module, including new interface and filtering options</li> <li>• Multiple jobs for same client to be bundled under a single bid request email</li> <li>• Visual map-like display of Recruiting jobs</li> </ul>
<b>Phase 3 – Post-Assessment of Recruiting Module changes</b>	2-5 weeks	<ul style="list-style-type: none"> <li>• Report unexpected bugs for correction</li> <li>• Report, if any, areas of mild redesign needed for proper functionality</li> </ul>
<b>Phase 4 – Preparation for Vendor Portal</b>	7-12 weeks	<ul style="list-style-type: none"> <li>• Discuss with contractors to understand UX needs</li> <li>• Document requirements for Vendor Portal</li> <li>• Design and proto-test interface with contractors</li> <li>• Submit design for programming, wait for completion</li> </ul>
<b>Phase 5 – Implement Vendor Portal</b>	1-3 weeks	<ul style="list-style-type: none"> <li>• Implement Vendor Portal system</li> <li>• Update all contractors; require contractors to use the Vendor Portal</li> </ul>
<b>Phase 6 – Post-Assessment of Vendor Portal</b>	2-4 weeks	<ul style="list-style-type: none"> <li>• Report unexpected bugs for correction</li> <li>• Report, if any, areas of mild redesign needed for proper functionality</li> </ul>
<b>Phase 7 – Implement General Minor System Changes</b>	2-4 weeks	Design submission includes: <ul style="list-style-type: none"> <li>• Record of automated messages</li> <li>• Global filtering</li> <li>• Sticky select menu for service categories</li> <li>• Set service mile radius of individual contractors</li> <li>• Automated notifications of canceled Search Report jobs</li> <li>• Updating of billing and max bid amount of Search Report jobs</li> <li>• Re-naming of organizations enabled</li> </ul>
<b>Phase 8 – Assessment of General Minor System Changes</b>	1-2 weeks	<ul style="list-style-type: none"> <li>• Report unexpected bugs for correction</li> <li>• Report, if any, areas of mild redesign needed for proper functionality</li> </ul>
<b>Phase 9 – Preparation for</b>	5-10 weeks	<ul style="list-style-type: none"> <li>• President with meet with department members and their managers to discuss and understand interfaces needed for information tracking</li> </ul>

<b>System Changes Accommodating Data Integration</b>		<ul style="list-style-type: none"> <li>• Design and proto-test user interface for new tabs</li> <li>• Submit for programming, wait for completion</li> </ul>
<b>Phase 10 – Implement System Changes Accommodating Data Integration</b>	2-3 weeks	<ul style="list-style-type: none"> <li>• Implement spreadsheet-like tabs on major modules for information tracking that is fully integrated and accessible</li> </ul>
<b>Phase 11 – Post-Assessment of System Changes Accommodating Data Integration</b>	3-4 weeks	<ul style="list-style-type: none"> <li>• Report unexpected bugs for correction</li> <li>• Report, if any, areas of mild redesign needed for proper functionality</li> </ul>
<b>Phase 12 – Implement New Security Controls</b>	1-3 weeks	Design submission includes: <ul style="list-style-type: none"> <li>• Restrict employees to only process their documents belonging to their department</li> <li>• Full auditing trails for any edited or deleted documents</li> </ul>
<b>Phase 13 – Improve Knowledge Management System</b>	3-6 weeks	<ul style="list-style-type: none"> <li>• Document all core business knowledge</li> <li>• Consolidate all business knowledge documents in a single place</li> <li>• Restrict documents to read-only format, editable only by managers</li> </ul>

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