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Switching from a semi-computerized to an online employment application system: A case study

[Deanna House](#)

ABSTRACT

This case explores the switch from semi-computerized to an online employment application system. This case documents the struggles experienced with user expectations related to requirements and how customization of a third-party product derailed the project's success. The project was eventually implemented, but not without a significant development effort to customize. The end project was over budget, over time, and did not have all of the functionality that the users were expecting. Key factors leading to the project failure were: lack of user involvement and participation throughout the project including documentation of requirements for the target system, lack of a dedicated project manager, resistance to the change, poor communication, inadequate requirements, and issues with the chosen software development methodology.

Introduction

Change in an organization can increase the efficiency of its business processes. Implementing a new information technology (IT) system can facilitate such changes. In the case of employment applications, the processing time that an application takes to get to a hiring manager can be a competitive advantage for an organization, particularly for hard-to-recruit positions in competitive job markets. This is particularly evident in technology and software companies where there may not be an adequate supply of qualified candidates for open positions. Paper based and manual processes can slow down the total time it takes an applicant to go from a candidate to an employee, also called time-to-hire. The improvement of the time-to-hire process can be realized by implementing an appropriate IT system. IT is seen as a strategic resource, with the successful implementation of said resources imperative to an organization's survival (Lai & Mahapatra, [1997](#)). The development and implementation of an online employment application system can provide a strategic advantage to an organization. The organizational changes required by such an implementation can pose challenges if the users are not adequately prepared prior to the software acquisition or if system requirements are not driven by the business needs of the stakeholders. This case study provides details on key factors that resulted in a failed implementation of an online application system. This system implementation occurred in 2002 – 2005. Although the project happened several years ago, the challenges faced are still valid and relevant in

today's organizations. Lessons such as these are invaluable to students, researchers, and practitioners when taking system users and processes into consideration.

The current system

Beginning in 2002, the human resources (HR) department of a telecommunications software firm, Telecom Inc.¹ had a business need to update the current process for handling job applicants. Telecom Inc., headquartered in Denver, CO, had 2500 employees and an annual revenue of USD 300 million. The company handled several hundred applications every week and the manual data entry and distribution of qualified applications/resumes was a significant bottleneck in the recruitment and hiring process. The system that the HR department was using was an antiquated Visual Basic for Applications (VBA) program within an access database. This online application system was used to track applicant data and interview information for job candidates. After the data were entered into the system, the suitability of potential employees could be matched with information obtained from various reports and ad hoc queries against the candidate information. Although the system was functional in tracking and analyzing applicant data, it had a major flaw in that it did not interface with the current HRIS system. This flaw was also compounded by the fact that hiring managers were not able to access the system to review candidates. One of the support staff employees, Debra, indicated that:

the majority of [her] job consisted of data entry, making photocopies, and filing paper employment applications, with minimal time for other duties.

Applications and resumes emailed or snail-mailed to HR were first entered into the semi-computerized system, then pre-screened by HR before sending to the hiring managers. After the pre-screening, Debra and another administrative support staff, Julie, made photocopies of the applications and resumes for the hiring managers and hand-distributed them. Any feedback from the hiring manager was then manually entered into the system by the administrative support staff. Typical feedback was an indication about which candidates to interview and which ones not to. Debra and Julie would then follow the process through to call the selected candidates for interviews. In addition, any updates to the candidates' profile were manually entered by Debra and Julie. The updates led to additional overhead and occasionally duplicated information for the same applicant. Occasionally, there were also miscommunications between recruiters and hiring managers if a candidate applied and interviewed for multiple jobs. These miscommunications sometimes resulted in embarrassing situations such as two managers making offers to the same candidate. An activity diagram of the current applicant feedback process is shown in [Appendix A](#).

The new system

It was determined by Kay, the Director of HR, that the time had come for an update or replacement of the current system. Executive management in HR determined that the current semi-computerized application system would need to be completely replaced. Generally, change is pushed by senior management into other parts of the organization (Clegg & Walsh, [2004](#)). Additionally, having change driven by top management influences system success (Sharma & Yetton, [2003](#)). For the organization, the change can be necessary to compete technologically (Kotter & Schlesinger, [1979](#)), but it is also necessary to include the future users of the system. The HR department wanted a more robust system based on enterprise-class technology that would seamlessly interface with the current HRIS software and also alleviate the hiring bottlenecks that were occurring during the recruitment process. It was determined that the new system should also be web-based.

The IT department was charged with the task of researching and presenting recommendations for viable replacements to the top management in the HR department. After an initial round of Request for Proposals and a cursory initial screening for suitability, the IT department arranged for demonstrations of three different software products. The requirements for the Requests for Proposals were very high level and were written by Kay and Scott, the Director of IT. Aside from ease of integration with current systems and being web-based, the HR team wanted software that would mirror the existing hiring processes and improve the bottleneck to make the process faster. The available software selection choices were to create an in-house developed application, or to perform significant customizations to an existing third-party software product. The IT department was a Lotus Notes-based development team. As the primary technical support and maintenance resource for any selected new system in the company, the IT department was a proponent of Lotus Notes-based solutions. This created a significant limitation in finding suitable employment application software.

Of the three presented solutions, two were chosen by management for further analysis before a final selection was to be made. The rejected third solution was part of a large-scale Enterprise Resource Planning (ERP) system that the company was not ready to invest in. The IT department completed a cost/benefits analysis for a customized off-the-shelf product and an Application Service Provider (ASP), hosted product. Even though the ASP system would be much cheaper to implement, the decision was made to purchase and modify existing software for proper interface with the new off-the-shelf product. It was determined by the HR department that the ASP option would not adequately meet the requirements of the users. After the decision was finalized, the project was assigned a project manager from the IT department, Helen. Helen put together a high level project plan. This plan was not communicated to the HR department.

Project phased development

The IT department had been using the waterfall systems development and implementation methodology. Waterfall methodology works sequentially through the phases of the Systems Development Life Cycle (SDLC): planning, analysis, design, and

implementation (Dennis, Wixom, & Roth, [2015](#)). After procurement of the software and as the custom development was initiated, the IT department re-reviewed the requirements. It was apparent that the purchased software package had some significant gaps that would need to be addressed before the third-party software could be implemented. Specifically:

- The front end that would allow applicants to apply for jobs via online employment applications was not part of the purchased third party software package.
- The purchased third-party software was not web-enabled for internal users or external applicants. Making the system web-based would allow HR to become more efficient during the hiring process.

At the outset, the following stakeholders appear in the case description below.

- Kay is the HR Director, Training and Information Technology
- Debra is Human Resources Support Staff
- Joseph is the External Independent Consultant
- Julie is the Business Analyst, HRIT
- Mike is the Project Manager, HRIT
- Scott is the Director, IT
- Helen is the Project Manager, IT
- Jim is the Developer, IT
- Erin is the Lead Developer
- Eric is the Developer, IT

Phase 1

It was estimated that it would take approximately 500 h of software development effort to fix above gaps. This effort was termed **Phase 1** of this project.

The IT department did not have appropriate or adequate resources immediately available to devote to the project Phase 1. A timeline based on a detailed analysis of gaps between user requirements and the purchased software had not been established. Once the required resources were fully ascertained, it was evident that the desired deployment date could not be met with the current developer resources in the IT department. Due to these resource limitations, the development would have to be outsourced. It was determined that the cost of outsourcing the additional development would be less than the cost of pushing back the system deployment date. Due to

resource limitations, the project was already heading toward a budget overrun as HR and the IT department budgeted additional capital for an outside consulting agency's services. IT department had not factored outsourcing costs into the initial Return on Investment (ROI) analysis when comparing the costs between in-house development and outsourcing. This apparently led to the rejection of the outsourcing option. Things were made worse by the later realization that the IT department did not have adequate internal resources to devote to the custom development and meet the initial go-live deadline. In the context of resource deficit, the business analyst Julie noted:

Unfortunately, the original internal developer was pulled onto another project that had a higher priority.

The IT department hired a consultant, Joseph, to complete the Phase I development. By the time Joseph began working on the customizations to the system, the original implementation date was already behind schedule by almost one year. Please refer to [Appendix B](#) for a list of Phase 1 functionality.

The development was completed in a timely manner but with budget overrun. However, after Phase 1 was completed the new online application system still did not meet HR department users' needs. Unfortunately this was not realized until after development was completed. Unfortunately, one of the drawbacks of waterfall methodology is that planning, analysis, design, and implementation phases are completed sequentially and entirely before the users see the finished project (Dennis et al., [2015](#)). Going back to previous phases if something is missed is not allowed. In order to accomplish successful implementation with waterfall methodology, significant time and effort must be spent on requirements documentation. Phase 1 only incorporated an online web-based employment application and it was quickly realized by the HR users that some key pieces of functionality were missing (Please see [Appendix B](#) for the functionality included in the three phases). Because HR wanted to maintain the existing hiring processes, the purchased software package would have to be further customized beyond Phase 1. The combination of scope creep and user resistance resulted in additional software development. The missing functionality delayed the go-live of the system until after Phase 2 development was complete. Julie mentioned that she

Had resistance from the users, with concerns about the lack of improvement to existing processes.

Additional details related to Phase 2 are discussed in the next section.

Phase 2

At this point, significant development time (500 h) had already been invested in the system yet it was still unusable. HR and the IT department prepared to begin Phase 2 development. Obviously the Phase 1 requirements were not written clearly enough because of the deficient functionality and this caused major problems. "In nearly every software project which fails to meet performances and cost goals, requirements

inadequacies play a major and expensive role in project failure” (Alford and Lawson (1979, pg. 37). After the Phase 1 release was determined to be inadequate, the methodology was adjusted from waterfall to the incremental development methodology (www.techopedia.com). The incremental development methodology was created in response to flaws and weaknesses associated with waterfall methodology. The incremental development methodology was a good choice in this situation because it was now apparent that the project team would need to integrate the Phase I software & additional Phase 2 requirements in a phased implementation.

Phase 2 would provide functionality for HR to flag candidate applications for hiring managers after a pre-screening process was performed and would also provide functionality for managers to view candidate applications in the system. Phase 2 also incorporated an approval process for open positions based on a departmental and organization hierarchy. The incremental methodology was not fully used, however, because the software development team was not aware of the full requirements at the beginning of the Phase 2. These missed requirements are discussed later in this section.

Kay, the HR Director of Training and IT, decided that the HRIT department would be responsible for writing the Phase 2 requirements, and she would also be accountable for signing off on these requirements. The HRIT department was created to assist the IT department with HR software and development implementations. A breakdown of the organization charts for the HRIT and IT departments is shown in [Appendix C](#). This department was housed in the HR offices and maintained a close relationship with both HR and the IT department. While requirements were being written for Phase 2, Julie transferred to the HRIT team from the administrative support staff role in HR and was considered a subject matter expert for the existing job application and recruitment processes. Julie was brought on as a business analyst but also had working knowledge of the candidate application processes. The requirements for Phase 2 were written using the original Phase 1 requirements as a base, but provided more details to help the developer understand the HR department’s needs. Julie assisted with writing the requirements and mentioned the following:

My knowledge of the application process, paired with the HRIT team’s knowledge, allowed us to document requirements and eventually meet the needs of the users.

When the new Phase 2 Business Requirements Document (BRD) was turned over to the IT department, a new project manager from the HRIT team, Mike, took over the project. This allowed HR and HRIT to have more control over timelines and milestones as Mike was housed in the HR department office and had a close working relationship with the department. Phase 2 software development extensively followed the BRD. Phase 2 required an additional 350 h of development effort. This development work was once again outsourced just like in Phase 1, because Joseph, the external consultant/developer, was already familiar with the software code and system set-up. In addition, HR was anxiously awaiting the completion of the online application system.

The HRIT team began meeting with Joseph on a weekly basis to discuss any issues and clear up any confusion related to the requirements. After Phase 2 development started, it was apparent that there were still missing requirements. For instance, the system was set up so that if an applicant wanted to apply for multiple positions, they would have to fill out a separate application for each position. Changing the setup of this system would require 150 programmer-hours of additional coding and also additional funds for consulting services. It was determined that the missing requirements would be documented and would become Phase 3. The failure to document these requirements was seen as an oversight and no one was held accountable.

Three months before the completed Phase 2 product was ready for turnover to HR, the HRIT team began preparing for User Acceptance Testing (UAT). It was decided by HRIT that this testing would be performed internally (within the HRIT department). Julie devoted extensive time to learn the new system as a user and develop test scripts to prepare for UAT. These scripts helped set the foundation for user testing. Julie noted:

The scripts also helped prepare the users for training and go-live for the new system; with additional documentation prior to go-live.

The test scripts helped with the preparation of training documentation and also assisted with testing efforts for future testing in Phase 3.

UAT started before the Phase 2 development concluded. This allowed Julie, the business analyst, to work with Joseph, the developer, to correct errors in a timely manner while the development was completed on-site in the HR office. The consulting agency had a proprietary database to help track software bugs. Although this was helpful, it was sometimes difficult to get a timely response from Joseph – especially later on when he was no longer on-site and was working remotely. This was partially due to a lack of formal software bug notification process.

It was the perception of the HRIT team that not enough system testing was performed during development, because the software had multiple serious errors. It seemed like Joseph created the system under his own assumptions, instead of communicating questions to Julie to communicate to the users. These system assumptions were very difficult to correct because the users had different assumptions and expectations of how the system should work in relation to their current processes. This non-communication ended up being costly because the project was already nearing completion and errors detected in later stages of development are expensive to correct (Faulk, [2000](#)). Another issue was that Julie was the only individual on the HRIT team who devoted a large percentage of her time to testing. This delayed overall testing time because she had to perform several iterations of – walking through test scripts, reporting errors to Joseph, and verifying that the errors were corrected. Julie mentioned:

The testing process was tedious and the turnaround times for bug fixes and retesting added a lot of extra wait time.

UAT did not go as smoothly as planned, and due to the errors and rechecks mentioned above, the go-live date was pushed back 2 more months. As Julie prepared for system go-live, it was important to prepare the HR users and manager users for the new system. The HR users had the ability to see all applicants for the multiple positions that they had open and also had administrative capabilities to manually provide a manager the ability to view an applicant even if that applicant did not apply for the position. The managers were able to see all applicants that applied for their open positions and also any applications that HR flagged for them. The new web-based online application system was quite a change from the old manual process, so the HRIT team created training documents and trained the HR department (and a select group of managers) before the system was implemented. An activity diagram of the new process is shown in [Appendix D](#). The training gave the user groups time to pilot the system and become comfortable using it. However, because HRIT performed acceptance testing (and not the users), the HR users found that the system did not exactly meet their requirements.

Phase 3

During user training, additional future Phase 3 requirements were documented. The users, though satisfied with the new system, found some aspects of the software to be not as user-friendly. Since the Phase 2 software development was written exclusively from the business requirements document and with input from the HRIT team, some requirements and features were overlooked or not properly addressed. For example, the software was only written to process external candidate applications and not internal candidates. This led to the current manual Internal Application process having to include a workaround until Phase 3 development occurred. The internal candidate applications had different field requirements since these candidates were already employed at the company. It was redundant for internal candidates to fill out address, employment history, and background check information in an online application. This oversight required the HR department to manually fill out an external application if an internal candidate applied for recordkeeping purposes. This was not an improvement from the original semi-computerized process and actually added some additional time compared to the old process. Another issue was that several design elements had to be adjusted, due to the fact that the users did not get to see features of the targets system until the systems development was completed. These issues meant that Phase 3 development was aimed at giving the new system complete functionality.

After the official system go-live, the HRIT team started documentation of the additional requirements related to applying for multiple positions, internal job applications, bug fixes, and screen changes as part of for Phase 3 development. This documentation lasted for 3 months to allow time for all issues to surface and provide users with a chance to communicate system-related changes. These requirements were listed in order of importance, then added to the BRD. HRIT and the IT department decided that the development for Phase 3 would be completed in-house with existing IT department developers rather than hiring an outside consultant. A walkthrough of the requirements was scheduled, and the IT department seemed to understand the requirements. The

walkthrough helped the team make time estimates for the development. Software development for Phase 3 was estimated at 500 h.

It was decided by the IT department that the enhancements and bug fixes of Phase 3 were to be divided into three bundles and released accordingly. The most important requirements were in the first bundle; which included functionality for internal applicants. The second bundle included added functionality which allowed applicants to apply for multiple positions without the need to fill out multiple employment applications. The third bundle incorporated bug fixes and minor changes to the online forms/data entry screens. The staggered release after each bundle of the Phase 3 coding would allow the HR department to receive a more functional system as quickly as possible. Again, this development method did not truly follow the incremental development methodology because the requirements were not decided upon until after Phase 2 was implemented. Each bundle had a specific implementation timeline. There were a few problems as described below that delayed meeting these timelines.

Before Phase 3 development started, maintenance was continuously being performed on the system because there were issues that were found after UAT. This continual cycle of fixing smaller problems required additional developer resources outside of the Phase 3 software development estimations. To add complexity to the matter, Joseph, the consultant hired to write the original system, was working on handing over the maintenance to an IT department resource, Jim. This involved knowledge transfer of both the business processes of the system as well as the details of the technical implementation. The difficulty of the knowledge transfer was compounded, as Jim did not have experience with the technology platform of the system, Lotus Notes. Jim's lack of Lotus Notes experience made it very difficult for HRIT to get support for resolution of online employment application issues and errors. When the original Phase 3 software development estimates were communicated, it was assumed that the development/system support resources assigned to this system would go to developers that had previous Lotus Notes experience. In reality, however, other projects took priority, and the actual resource assigned to the project, Jim, lacked Lotus Notes experience. Despite Phase 3 being assigned to an inexperienced developer in lieu of one well-versed with Lotus Notes, the original hour estimates for Phase 3 were not adjusted. As a result, the actual coding time took about two times the estimated hours. Further hindering the deadlines was Jim's inability to commit 100% of hours worked toward this project. This was due to other software development and support priorities.

All departments involved (IT, HRIT, and HR) were frustrated by the delay in system fixes and response to requests, but had little control over the situation. Production efficiency was less than 50% making actual times taken almost twice of original estimates thus making scheduled deadlines impossible to meet.

The Phase 3 development changed the system functionality and setup extensively, so in-depth system and user testing was mandatory. Specifically, the functionality to connect one applicant to multiple positions added complexity to software development. In addition, creating a separate internal employment application that was different added in screens that required an applicant to select whether or not they were an

internal or external applicant. The HRIT department requested written documentation of system and integration testing from the IT department. This documentation helped the HRIT department know that system testing was performed. The previously mentioned delays were compounded by the fact that Mike and Helen, the project managers, did not integrate system testing into the project plan. This caused confusion about the actual implementation schedule. In addition, since Jim was not familiar with the online application system, system testing still took a long time.

Phase 3 UAT included a user-group testing team to provide additional testing feedback and ensure that the changes met the requirements of the users. A brief UAT training session was held for the group because none of them had prior testing experience. The testing was performed, but errors were still missed because the functionality had changed so much. This, coupled with the fact that the project plan did not allow for testing, caused the scheduled implementation dates to be late once again.

Phase 3 implementation was further put on hold when Jim was laid-off. This required some recovery time for the IT department. Luckily, the new assigned developer resource Erin had extensive experience with Lotus Notes. However, she was unable to commit adequate development time to Phase 3 and another resource, Eric, had to be assigned. Because so many different developers had worked on the system, and the company did not formally have a development process documented, there was an extensive learning curve each time the developer changed. This hobbled progress as development slowed with each resource change due to the poor efficiency at the low end of the learning curve.

When requirements were written by the users, they had no or little idea how the end-product would function. The IT department could not visualize the product as a whole, and it caused several software bugs. In addition, as Phase 3 was wrapping up, the IT department decided to phase out Lotus Notes for newer technologies. The newly implemented online application system had only been in production for 1.5 years and was already becoming obsolete. The cost-benefit analysis was only performed for the initial software review in the planning phase prior to the online application project selection and development starting. This should have been initiated each time a new development phase was realized. In addition, an ROI was not completed until resources were being assigned for Phase 3 development. The ROI only considered Phase 3 development.

At end of Phase 3 software development had already taken over 1500 h, not including support time and bug corrections after go-live, and the original cost of the software. Had the IT department communicated its decision to eventually phase out Lotus Notes technologies earlier, the number of available online employment application software options would have increased significantly. The project should have been re-evaluated before development of Phase 2 started. Close to a year after the implementation of Phase 3, the project was moved to corrective maintenance mode, receiving only error and bug fixes, and was eventually phased out and replaced by an integrated Enterprise Resource Planning (ERP) system.

Post-mortem insights and lessons learned

The company learned many things after the implementation of this project. Although the IT department is still not using a formal incremental methodology process, HRIT and the IT department are making valiant efforts to keep any similar projects failures from happening in the future. For instance, every software project that is either developed, purchased, or enhanced will formally go through a requirements writing process with multiple stakeholders involved. This ensures that more than one stakeholder will have input. In addition, each existing software project will have an ROI performed every 3–5 years to ensure that the system is still providing value to the company. All new software projects will have an ROI performed before development commences.

Additionally, the HR department has undergone a complete business process re-evaluation to attempt to improve business processes within the department. This department-wide exercise has created a more efficient, cost-conscious HR. It is the department's goal to continue to improve processes as much as possible and to “think smart”. These process improvements saved the company almost \$1 million from 2004–2006. The HRIT department strives to organize the development in such a way that the HR department receives the best quality software for their time and money. The online application project taught the team many valuable lessons that have and will improve the performance of the company, and ultimately the bottom line.

Common reasons for project abandonment are overrun costs and schedules; lack of user participation, lack of technical expertise, end-user conflicts (Ewusi-Mensah & Przasnyski, [1994](#)) – all of which this project had. Additional factors mentioned in literature are resistance to change, poor communication, inadequate requirements specification, insufficient user involvement, and lack of accountability. IT, HRIT, and HR department managers and stakeholders are reflecting on what went wrong and what steps they should take in future systems development and implementation to avoid the woes and frustrations they faced in this project.

Supplemental material

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Additional information

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Deanna House is an Assistant Professor in the Cybersecurity Department at the University of Tampa. Her research interests are behavioral security, social engineering, and systems analysis and design. She explores behavioral aspects related to phishing and social engineering and the mechanisms that prevent such attacks. Deanna received her PhD in Information Systems from the University of Texas at Arlington and her Master's in Management Information Systems at the University of Nebraska – Omaha. She has presented research at the National Decision Sciences Institute Conference, the Southwest Decision Sciences Institute Conference, and the Southwest Academy of Management Annual Conference.

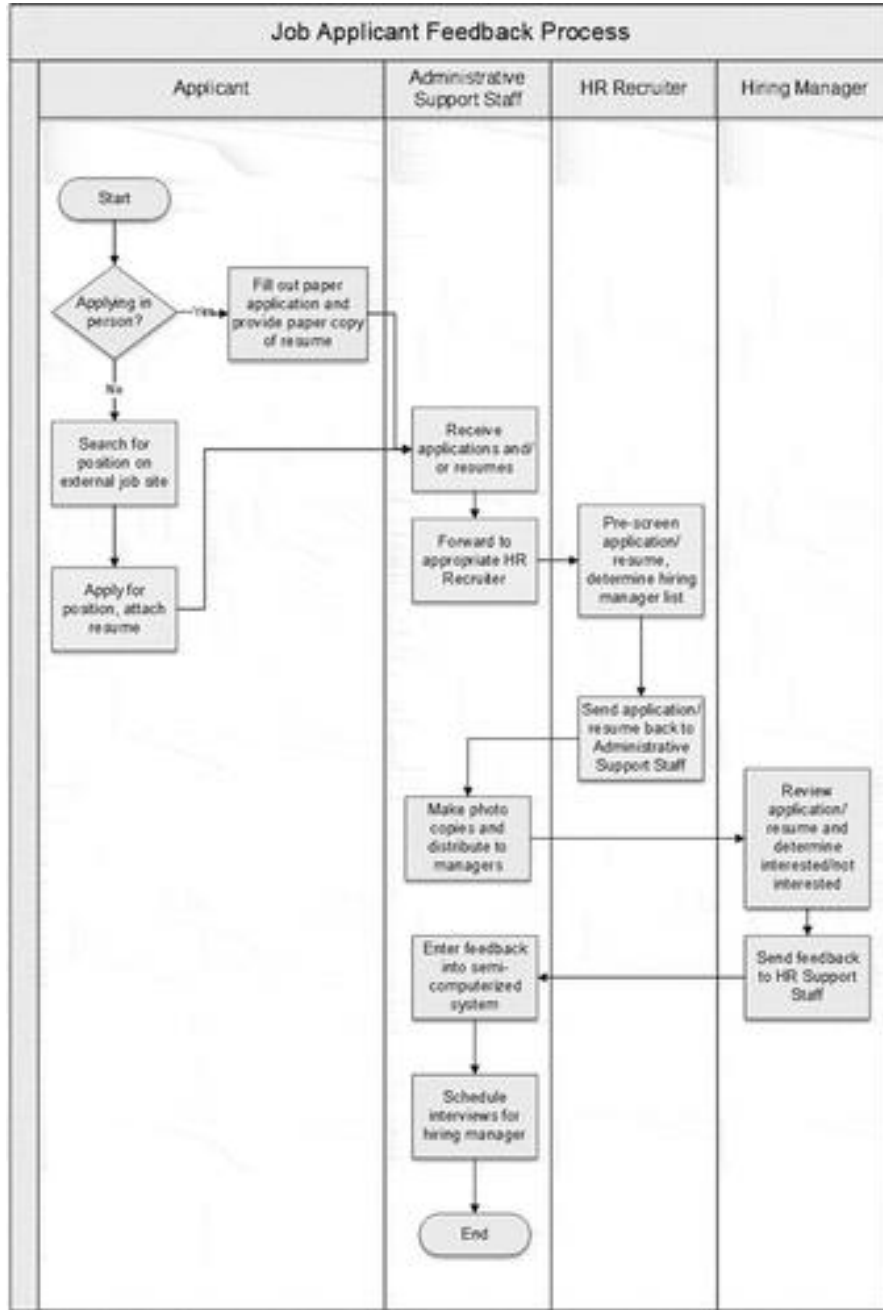
Notes

1 All names have been changed to protect the identities of the employees and company.

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Appendix A: Semi-computerized job applicant feedback current state process



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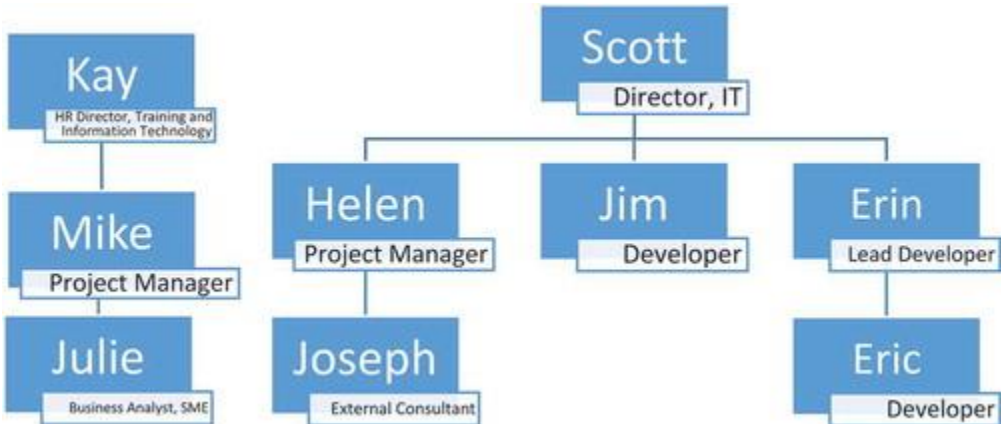
Appendix B: Software functionality/development by phase

Table

Phase:	Software Functionality:
1	Applicants apply for jobs via online employment applications Job requisitions/open positions online
2	Hiring managers able to see applicants for open positions Human resources flag applicants to pre-screen for hiring managers Job requisition approval process (via hierarchical organization approval workflow)
3	
Bundle 1	Internal employment application functionality
Bundle 2	Applicants able to apply for multiple positions while only completing one employment application
Bundle 3	Miscellaneous bug fixes and minor changes to the online forms/data entry screens

[CSVDisplay Table](#)

Appendix C: Organization chart for HRIT and IT departments



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Appendix D: Online application future state process

