COMP4 Project

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Includes full analysis, design, specific implementation, testing and evaluation

2015

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# Analysis

## Identification of problem

The main end user is my father, Peter, who currently owns a construction company called Top Builders. He conducts all sorts of construction work, including extensions, furniture fixing, painting & decorating, and more. The company is a small family-based business, and Peter tends to work alone, but sometimes he will hire workers to help him with larger-scale projects. After a few years of good trade, he is looking to expand his business by taking up more projects, hiring more employees and deviating away from a small-scale family business to something more structured. He needs a system to aid him in managing quotes, invoices, employees and his stock of materials in order to ensure a smooth running of the business and decrease the amount of time spent on bureaucracy and administration.

## Observation of the current system

Being Peter’s son and living in the same house as him allows me to observe the working of his current system almost every day. For example, very recently a customer called him on a Friday enquiring about a job offer; I witnessed the whole conversation and found out a lot about the types of information which my dad requires to start a project. He arranged an appointment to see the client on the next day (Saturday). I asked to accompany him in order to better understand his work pattern.

We left at 10:00am and made our way to the client’s house. Upon arrival, the client showed us to the kitchen where a whole refurbishment was needed. Peter spoke with him about exactly what needs to be done, which furniture needs to be replaced, the details of any plumbing/electrical work and the estimated time of completion. He used pen and paper to note these things down while I observed. At about 3:30pm we left the client, and said that we would e-mail him with the quote for the required work.

We returned home at about 4:00pm and immediately began working on a quote in Excel. Peter often makes me operate the computer while he simply dictates the jobs, their details and prices as I input them into the spreadsheet; this is due to my better IT and English skills. This makes me very knowledgeable in the exact workings of an integral part of the current system, and I have first-hand experience at the somewhat clumsy and time-consuming process of creating customer quotes (price estimates).

Peter then e-mailed the quote to the client, and after some further negotiations and changes to the quote, work could begin. The details of the job were recorded in a “job book”. Peter needed a helping hand with this kind of project, so he hired an employee (which he has worked with before in the past). He did not need to record the employee on paper, as it was just one employee – but for other projects, where teams of employees are needed, an “employee book” would be used, where their working times and pay rates would be recorded. Both of these record-keeping books are held in the company cabinet at home.

## Document analysis

The following are screenshots of various invoices which were produced by Peter over the last couple of months. The invoices are made entirely in Excel and are not standardised – most invoices differ in layout, look, table headings, etc. The reason for this is the lack of any rigorous system which takes care of standardising invoices to ensure a consistent look for every job/client. The new system should have a way of exporting invoices into Excel format which looks similar to the invoices made already, and follow a pre-determined layout.

## N:\Computing\2b46de8094305c42b70a5e0d7ae3820d.png

## N:\Computing\sshot-2.png

## N:\Computing\83ccadcf4a8ef9350b96a39650cf077c.png

## Interview of company CEO

In order to find out more details about the prospective end user, I carried out a live interview with Peter. This interview aimed to provide the basis for analysis of the current system limitations, setting targets for the new system, planning a feasible solution and ensuring that the finished product meets the requirements of the end user.

**Norbert**: To start us off, what do you currently do for a living?  
**Peter**: I own a building company called Top Builders. I do all kinds of construction work including extensions, kitchen and bathroom fitting, tiling, painting and decorating, etc.  
  
**Norbert**: Do you work on your own?  
**Peter**: Mostly, yes. I am self-employed under the Top Builders name and the company is entirely self-run. However, for some bigger jobs, I may hire a couple of workers that help me. I pay them a working wage but act as the project manager, while still of course working with them on-site.

**Norbert**: How do you co-ordinate your workers, keep track of how many hours they have worked, etc.?  
**Peter**: Well, I guess I just keep it in my head, or write it down. I hand them the money after a week of work and just tell them the days when they should come in and where we’re going.

**Norbert**: That sounds a bit cumbersome?  
**Peter**: It is, but I don’t hire that much workers for it to be too much of an issue at the moment. However, if I carry on getting large-scale projects like I have been recently, it could get very disorganised.

**Norbert**: What about the details of all the jobs you need to complete?  
**Peter**: I record those inside a large “job book”, which records the details of every client, the jobs they need us to do, things like that. I use this information to later produce a quote for the client.

**Norbert**: Do you ever advertise, or is your business quite small?  
**Peter**: I give out business cards to any potential clients which may require my services. I am advertised on Yell and have a van with my business logo and contact details on it. I also had a simple website which listed all my services, but found it not useful enough in bringing in new clients for the price I was paying, so I got rid of it.  
  
**Norbert**: How do you find your work, and then how do you proceed to complete it?  
**Peter**: I receive work, very often through recommendation, from a potential client and immediately arrange a meeting to inspect the premises and discuss the details. Using this information I then produce a price estimate (quote) listing all of the specific jobs that need to be done for the client, and the total cost. I then present this quote back to the client, discuss any amendments, and begin work immediately. Once complete, I hand the client an invoice, which is basically just the same as a quote, but with slight amendments to reflect the exact work that was completed.

**Norbert**: Could you tell me more about what you include in your quotes?  
**Peter**: My quotes tend to differ a lot due to the fact that I make them manually in Microsoft Excel. Usually I will have a table of 5-10 jobs for the project, with different materials listed for every job. I will then have a price for every job, and sometimes break this price up to indicate labour and material costs. I will also have a total at the bottom. I like to include my company logo and the name and address of the client, although sometimes forget to do this.

**Norbert**: And how long do these quotes take to produce?  
**Peter**: Well, I am nearly 50 years old and although I don’t consider myself completely backwards in terms of technology, messing around in Excel can sometimes take me up to 3 hours to complete one quote. Most of the time I just ask you to do it, as you’re much quicker.

**Norbert**: What would you like the new system to do for you?  
**Peter**: I mainly want something easier than Excel produce my quotes for me quickly and efficiently. I want to be able to quickly launch an application, fill in some jobs details and figures and have it printed off and the client e-mailed within minutes. Of course the format still needs to be Excel, just not made using Excel, if that makes sense, as I find most clients are able to open such a format, and it can be made to look nice.

**Norbert**: Is that all you need the system to do, or do you have anything else in mind?  
**Peter**: Well, I’m open to suggestions. Anything to make my life easier.

**Norbert**: Well, what about the future? Where do you see your business going?  
**Peter**: Right now, everything is going pretty well and I would love to turn this into a more of a structured enterprise rather than a small family business. I will definitely be pursuing some higher forms of advertising in the future so that I can get a much larger volume of clients. Of course, this will mean hiring a proper team of employees. A proper website will eventually become a must.

**Norbert**: What would this website contain?  
**Peter**: A description of all the services I provide, a gallery, my contact details. It would also be nice if clients could request a quote online which I could somehow see and complete.

**Norbert**: That could definitely be something I could include in the system, allowing you to respond to quote requests submitted online. Would that be useful?  
**Peter**: Absolutely! It would be incredibly convenient to direct potential clients onto the future website and allow them to describe their problem without me having to take the time out to see them or call them.

**Norbert**: How do you currently get all of the materials you need to complete a project?  
**Peter**: After producing the final quote I take a trip to any builders’ warehouse such as Selco and pick out all the things I will need. This sometimes takes more than one trip and is quite tedious to do, but I have no other choice. If the business was large enough, I would probably store a stock of materials somewhere and pick them out from there.

**Norbert**: Surely you would need something to manage that stock electronically?  
**Peter**: I would indeed.

**Norbert**: That’s something worth looking into for the new system. Finally, do you have any final thoughts on how you would like your new system to function?  
**Peter**: I just want something that works well, is fast and isn’t overly complicated. Initially I just wanted a simple quote maker, but now that I think about it, the expansion of my business may come quite soon and I will most likely require other tools to help me. For example, that stock of materials manager you mentioned sounds like it could be very useful.

**Norbert**: I will definitely aim to produce something that satisfies your long-term requirements. Thanks for your time, it was very helpful in determining exactly what you need.  
**Peter**: No problem.

Interview was conducted in Polish and later translated and adjusted for easier understanding.  
Following this interview, the (main) end user will simply be referred to as **Peter**.

## End user questionnaire

Although the interview has provided me with a lot of information, this questionnaire was also given to Peter to complete. It deals with more quantitative information which will clear up concerns regarding data volume and other details which weren’t discussed previously. This will hopefully further enhance my knowledge of Peter’s work pattern, eventually leading me to creating a more effective piece of software for him.

1. How many hours per week do you spend on completing tasks related to the running of your business (creating invoices, speaking with customers, etc)?

*6-8*

*3-5*

*< 3*

*> 11*

*9-11*

1. How many of these hours are spent on tasks which require you to use a computer?

*6-8*

*3-5*

*< 3*

*> 11*

*9-11*

1. How many projects do you complete during an average quarter (3-month period)?

*> 11*

*9-11*

*6-8*

*3-5*

*< 3*

1. How many projects do you expect to complete during an average quarter in about 2 years?

*9-11*

*6-8*

*3-5*

*< 3*

*> 11*

1. How many projects does an average client provide (not necessarily at any one time)?

*3*

*2*

*1*

*> 4*

*4*

1. How many different types of materials does an average project require?

*< 4*

*> 21*

*16-21*

*10-15*

*4-9*

1. How many employees do you currently hire to accommodate for all your projects?

*2-3*

*1*

*> 7*

*6-7*

*4-5*

1. How many employees are you expecting to in the next 2 years?

*6-7*

*4-5*

*2-3*

*1*

*> 7*

1. How many individual jobs does an average project require?

*6-10*

*< 5*

*> 20*

*16-20*

*11-15*

1. How many times per week on average do you receive calls from potential clients?

*2*

*< 2*

*> 4*

*4*

*3*

## Description of the current system

After primary observation of Peter’s current system, document analysis, the interview and completion of the questionnaire, Peter’s current system may be summarised as follows:

1. Find a client, either through recommendation, advertising or otherwise
2. Consult with the client, assess the construction work to be completed
   1. Peter records a new client’s details and the job details in the company job book
3. Produce a quote (price estimate) of the work and present this to the client
   1. The quote should include a breakdown of all the jobs to be done for the whole construction project, the details of each job, the materials required and the prices for each individual job
   2. This is currently done manually, using an Excel spreadsheet
4. Further consultation with the client based around the produced quote
5. Employees are hired for the project, and assigned concrete tasks and working hours
6. Work then begins
7. After the construction project is complete, the client is handed an invoice which represents the actual work done, materials purchased, and overall cost
8. Employees are paid

## Identification of prospective users

The main user of the system will be Peter, as he is the CEO of the company and deals with all client-business communications, like initial consultation or quote and invoice creation. He is also responsible for managing employees, and in the future, when his company expands, there is a possibility of him hiring higher ranked employees to manage workers across different projects for him. Another prospective user is an employee of the company, who should be able to use the system to get information such as tasks assigned during a project, hours of work and wage rate. An easy way to contact the responsible supervisor, such as a manager or Peter himself, should also be provided in the form of e-mail.

Summary of users:

1. Peter (company CEO)
2. Any managers/supervisors
3. Regular employees

## Limitations of the current system

Based on the conducted interview and outline of the system, the following limitations can be concluded:

* Creation of invoices is cumbersome and requires tinkering with Excel spreadsheets
* Invoices/quotes are not standardised, i.e. the layout and look of each quote differs
* Employees are managed on paper (sometimes not even formally recorded)
* No way of potential clients to request quotes without meeting Peter
* No way of organising tasks between employees, leading to disorganisation
* Material must be found and purchased manually

## Identification of user needs

Peter needs a system which solves the above limitations. The list of user needs and acceptable limitations may be summarised as follows:

* Manages any amount of current projects
* Automates the creation of quotes/invoices, with the capability of exporting to Excel
* Allows customers to request a quote using an interlinked online form. These “quote requests” will be placed in a queue and completed in the order received. The client will be e-mailed with the completed quote
* Provides an employee management system, with capability of assigning concrete tasks and different pay rates
* Provides an employee login system which lists assigned tasks, pay rate and easy contact with project manager through e-mail
* Manages the stock of materials, keeping track of the different types of material in stock and potential shortages based on the current projects to be completed
* Produces stock reports which list material lists/deficiencies

These are the main things which the new system should accomplish. Some other, less critical features, but ones which could be implemented as an extension to the completed system, are as follows:

* Allows new materials to be found through various online stores, through a search system which filters for best prices
* Allows account customisation through an adequate list of settings/preferences to suit user needs

## Data sources and destinations

|  |  |  |
| --- | --- | --- |
| Data | Source | Destination |
| Client details | Client (e-mail, phone, word of mouth) | Company job book |
| Job descriptions | Discussion between Peter and client | Company job book |
| Job costs | Peter | Client, company job book |
| Job materials | Discussion between Peter and client | Client, company job book |
| Employee full name | Employee | Peter |
| Employee address | Employee | Peter |
| Employee contact number | Employee | Peter |
| Company business email | Peter | Client |

## Data volumes

Data volumes will be analysed based on the information provided in the questionnaire and interview.

Top Builders works on about 3-5 projects during an average 3-month period. However, the business may soon expand and Peter expects this to this number to increase to approximately 9-11 in about 2 years. It is therefore important to create a scalable system which is capable of managing the higher data volumes in the future. Taking 10 projects as an average volume of projects per quarter, this requires about 300 different individual jobs if the average project has 10 jobs. For these 10 projects, Peter indicated that he will hire more than 7 employees which will all need an account in the system. Peter indicated about 6-10 different types of materials are used for an average project, so 10 projects could mean about 60-100 different material requirement entries in the database. This doesn’t take into account the fact that a separate storage is needed for the entire material stock which could exceed about 50 material types. Regarding quote requests, Top Builders receives less than 2 calls per week from a new customer. Therefore we can assume to receive about 1 online quote request per week, and this is likely to be higher as the future website increases its ranking on search engines and upon company expansion.

*Note: this project will not focus on creating an online website for Top Builders. The aim is to create a project management system, and the online quote request element will be a simple form designed to be “plugged in” to the (potential) future website, which I will not be creating.*

## Analysis data dictionary

|  |  |  |
| --- | --- | --- |
| Field name | Data type | Details |
| Client full name | String | First and last name of a client |
| Client address | String | Street name, town, city and postcode |
| Client contact number | Integer | Preferably a mobile number on which the client can always be reached |
| Client e-mail address | String | The main medium of contact between the client and the business, used to send quotes and other documents like construction plans, as well as general updates or enquires while the job is being completed |
| Job descriptions | String | Up to 150 words per job of a clear outline of what has to be done, e.g. “Fix new living room furniture” |
| Job costs | Real | The cost of an individual job |
| Job materials | String | The materials required to complete a particular job, e.g. for a kitchen refurbishment, a new counter top may be needed |
| Employee full name | String | First and last name of an employee |
| Employee address | String | Street name, town, city and postcode |
| Employee contact number | Integer | Preferably a mobile number on which the employee can always be reached |
| Employee e-mail address | String | Must be a valid e-mail address which is often checked, as it is used for a lot of business communications with the employee |
| Employee wage rate | Real | An hourly wage rate |
| Employee work hours | String | A specification of the concrete days on which the employee is expected to work as well as exact start/end times of shifts |

## Data Flow Diagrams

Data flow diagrams are provided for both the existing and proposed systems, both for

# Level 0 existing system DFD

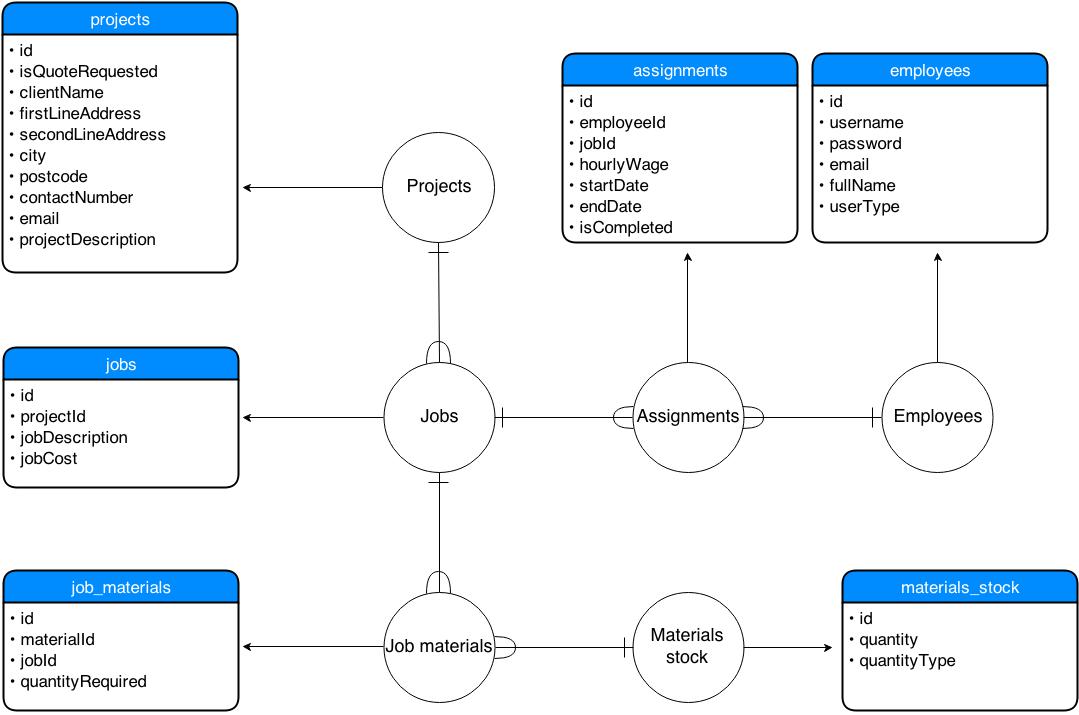
## N:\git\BuildersCentral\BuildersCentral\COMP4 Project - Norbert Podsadowski\Level 0 DFD - Existing System.jpg**Level 1 existing system DFD**

  
Level 0 proposed system DFD

Level 1 Proposed System DFD



Level 1 proposed system DFD 

Entity Relationship Diagram  
  


System objectives

1. Storage
2. Processing
3. Output