
How To Solve A Jigsaw Puzzle



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1 How To Solve A Jigsaw Puzzle

This document contains the slides and notes from a presentation which describes the job of a business Analyst.

It displays each slide in the presentation followed by a description of the message being conveyed by the slide.

1.1 Purpose

- Explain the role of a Business Analyst
- Describe what an experienced Business Analyst can do to help improve productivity
- Demonstrate the job of a Business Analyst in terms of an activity with which everyone can relate

I have always found it difficult to describe the benefits that the Business Analyst role brings to an organization in terms of the activities and artifacts produced by the BA. Describing use cases and their purpose to the average person in the street requires considerable explanation in the software development life cycle first.

The purpose of this presentation is to present the activities, artifacts and problems experienced by a business analyst in a format that can be understood by a typical business worker.

1.2 Overview

- This presentation uses a jigsaw puzzle as an analogy for a requirements analysis process
- A jigsaw puzzle represents a problem in terms of a picture that has been chopped up into small pieces
- The puzzle pieces are scattered randomly within a defined space
- As the person responsible for completing the puzzle, in this presentation you are performing the role of the Business Analyst

A jigsaw puzzle is one of the most common and simple puzzles imaginable. Yet in its simplicity, the solving of a jigsaw has many things in common with the much more complicated tasks performed by a business analyst.

By a defined space, I mean that we do not want to have to search forever for a missing piece. We can skip that piece and continue with the puzzle, expecting the missing piece to show up eventually.

The presentation walks the reader through the steps of completing a jigsaw puzzle from the beginning.

1.3 One I Completed Earlier



Here's a picture of a puzzle that I completed earlier. Yes there are a few pieces missing, but it contains enough information for the reader to understand what it is describing.

In my experience, the completeness of this picture represents the completeness of a typical requirements specification. The missing pieces do not prevent us from being able to describe the puzzle to someone who needs to know what the picture is describing.

1.4 The Parts Of A Jigsaw Puzzle

- Pieces – The parts that make up the whole puzzle
- Edge Piece – A piece of the puzzle defining a boundary
- The picture – There are generally 2 pictures that come with a jigsaw puzzle
- The picture on the box, describing solution to the jigsaw puzzle
- The picture on the pieces, that assist with solving the puzzle
- Object – A group of pieces which form an image within the picture

Pieces include the special edge piece type. The edge piece describes a boundary to the puzzle.

The picture on the on the box provides a solution which can be used as a map for the puzzle picture.

An object represents a part of the puzzle where all the pieces making up that part are connected to one another.

1.5 The Analogy To Requirements

- The interior pieces – Map to the requirements that describe the problem being solved
- The edge pieces – Map to interfaces defining the boundary of the problem space
- The picture on the box represents a solution to the problem
- The picture on the puzzle itself represents the specification of the problem
- Objects in the picture – Represent the different functions which are impacted by the requirements, that form the specification of the problem

The picture on the puzzle should map very closely to the picture on the box that describes the solution to the puzzle. The comparison between the puzzle and the picture might be analogous to testing the solution against the specification. In the case of a puzzle it is the solution that came first and the specification later, (so any 'bugs' would be written against the requirements).

Just as we break down a specification into sections that describe a related set of requirements, similarly we describe the puzzle in terms of the objects in the picture.

1.6 Examples Of The Analogy

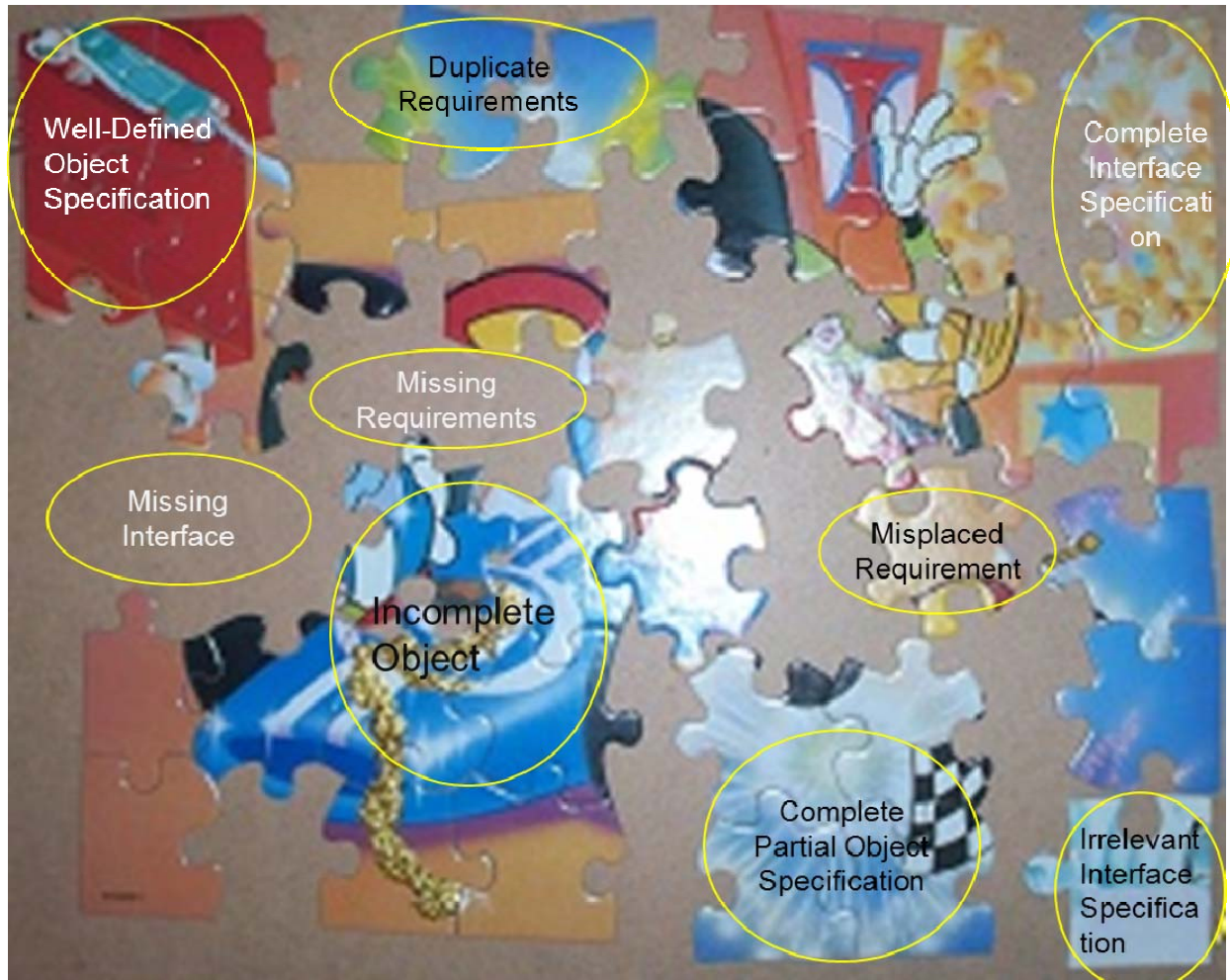
- A piece might be equivalent to a requirement for user security in order to login to a system
- An edge piece might be the specification of an interface to a LDAP system for user lookup
- The box picture a solution which allows users to login, access and change company information and logout again
- An object in the picture might represent a set of requirements for a function, i.e. a user request for help to login because they are unable to locate their username and password

The solution is a system that satisfies the vision of the project. The vision is specified by requirements. Requirements describe functionality that the solution will provide.

The edges will often describe an interface to the user. The UI is an interface and as such requires its own specification, just as a system interface does.

[LDAP – directory of access privileges is a service that records users and their access rights to information on one or more systems.]

1.7 Example: Requirements Document



The picture represents the state of a typical draft requirements specification document (Software, system requirements or functional specification, for example). Some parts of the puzzle that are analogous to the documented requirements are highlighted as follows:

Well-defined object specification – The part of the puzzle represents a relatively complete section of the specification.

Duplicate requirements – These pieces are similar and appear to overlap; are they specifying the same part of an object in the picture?

Complete interface specification – The edges to this object in the puzzle appear to be complete, even though the object itself is not fully defined.

Missing requirements – A major part of the specification is obviously missing.

Missing interface – A large gap in the edge pieces indicates that a complete interface may have been overlooked here.

Misplaced requirement – This requirement is obviously in the wrong section of the document and one might question whether it is even part of the problem being solved (out of scope).

Incomplete object – This appears to describe a well-formed set of requirements, but it is missing a major part of the object.

Complete object specification – This section appears to be a well-formed object and there is a complete interface specification associated with the object.

Irrelevant interface specification – This piece specifies an edge that does not appear to be relevant to the problem space.

[BTW: The above picture is a very good representation of some of the specifications that I worked on early in my career.]

First cuts at a specification are often delivered in no better condition than the above example. The question is, what do we do with a requirements specification in this state?

1.8 What Do We Do About It?

- We review the puzzle to locate errors
- Reviewers do not have a complete picture to compare against
- We work from a picture of the requirements that is 'good enough'
- Missing and incomplete requirements may be discovered by developers and testers
- We deliver an erroneous solution to our customers

We can review the document in an attempt to fix all of the errors. But this is a very time-consuming exercise and most of the reviewers have other jobs to do. Furthermore, without a well-defined vision what do the reviewers review the requirements against? How do we know if a requirement is in or out of scope? Note that unlike most jigsaw puzzles, reviewers do not have a box with a picture on to compare the specification against. The picture is in their heads, and everyone sees a different picture.

The project may decide that there is not time to go back and fix the requirements. The specification is used as the basis for development anyway.

We cross our fingers and hope the gaps are filled in on the way to delivery. (Hopefully the developers fill in the gaps with the right code.)

Analysis Process

Instructional Document

Analysis Of A Jigsaw Puzzle

Presentation

Ultimately, this specification will produce a delivered product which the customer did not want, for the most part.

2 What Does The Analyst Do?

The 2nd part of the presentation describes the activities of the business analyst in order to make a more complete picture with the pieces of the puzzle.

2.1 Activities Performed By Analysts

- Gather requirements – Collect pieces of the puzzle from various sources in the workplace
- Solicit – Search for hard to find pieces by interviewing stakeholders
- Elucidate – Arrange the pieces into groups which represent objects and edges in the puzzle
- Scope – Put the edge pieces together in order to define the boundary to the puzzle
- Organize – Use the groups of pieces to start creating objects in the picture
- Analyze – Connect the objects and edges of the puzzle to create a complete specification of the problem

This slide contains an overview of the slides that follow.

2.2 Gather Requirements

- Requirements may come from anywhere
- The project vision is the starting point of your journey to locating the requirements
- Existing documentation, business procedures, user manuals and the existing system can all be used to start the requirements analysis process
- In some cases a piece of the puzzle may be missing; in this situation you must, using your best guess to create it yourself

Anyone with a vested interest in the final product may contribute to the requirements; from the CEO of the company to the testers who have to validate the final product.

The project vision is your best guess as what the final picture on the puzzle will look like.

One of the best ways to get requirements is from playing with legacy systems, if they exist. Another way to gather requirements is to volunteer your services to the various departments that will use the final product (although this may not be immediately accepted as a good idea).

As an analyst you will often envision ideas for requirements that have not been solicited from stakeholders. Don't just blurt out these 'new' ideas in the middle of a meeting. [I find that doing this automatically generates a negative reaction.] Interview an interested stakeholder to determine if your idea has a chance of being accepted. If the reaction is positive, then document a proposal for the pros and cons of accepting this idea as a requirement and make sure that it is added to a scheduled meeting agenda. [IME, Stakeholders don't like being taken by surprise by BAs. We come across as smartasses who are not an expert in their business area. Better still if you can attribute this 'great' idea to someone with expertise in the appropriate field. In general I find that BAs will gain more acceptance from a business area if they do not try to become an expert in that area of the business. Leave the expertise to the business people and learn what you can from them. (I could start a blog on this subject alone.)]

2.2.1 Haphazardly Gathered Requirement



This picture is supposed to represent the state of the requirements when the BA has gathered all the information they can about the project. (You can't tell from the picture, but lots of pieces are missing and many do not belong to this puzzle.)

2.3 Soliciting Requirements

- Pieces of the puzzle are scattered over various departments within the organization; for example the security department has access requirements
- Don't expect to find all of the pieces from a department stacked neatly on the supervisors' desk
- Look for pieces to come from anyone that works in the department and even people interfacing with people within that department
- Pieces may be mixed in with pieces from other puzzles; for example the security department is not only concerned with access to computer systems, but also with access to the company premises

Once the BA has gathered enough pieces they should have a pretty good idea of who the stakeholders are for the project. It is now time to start interviewing those stakeholders in order to discover their own vision for the project (everyone will have a different vision).

Watch out for requirements that are out of scope. Stakeholders will often discuss problems with the current process that will not be solved with the new system. Note conflicting requirements from different departments. These will require larger than 1-on-1 sessions to resolve. Try to discover exceptions to the business process being described at every step.

2.3.1 Solicited Requirements



The above figure represents an initial organization of the requirements. The pieces are for this puzzle, they are facing in the right direction (picture up) and we have started to separate the edge pieces (discover scope).

2.4 Elucidate Requirements

- Once we have gathered a large number of pieces for the puzzle we now organize them in such a way that we can get feedback on what we have gathered
- Pieces are grouped into piles that appear to be for the similar parts of the puzzle
- Odd or outstanding pieces are shown to the stakeholders for clarification whether they are part of the puzzle, or need further identification as to which object in the puzzle they belong to

At this stage the requirements have been gathered from existing systems and documents; stakeholders have been interviewed to get their idea of the vision for the project. Now the BA starts to organize the information they have into manageable packages.

Pieces that do not clearly fit into one package or another may be taken back to the appropriate stakeholders for clarification of their purpose.

2.4.1 Pieces Organized Into Groups



The above picture shows pieces of the puzzle organized into groups of a similar pattern. Pieces on the right do not easily fit into any particular grouping. Some are of a unique pattern and some may fit into many groups. We will deal with these later.

2.5 Scoping Requirements

- Define the boundary for the problem space, just as one might start a puzzle by completing the edge pieces first
- Work with requirements, we identify the interfaces to the problem space by specifying the events and data entering and leaving a solution
- Actors (systems and people interfacing with the problem space) provide the scope
- Draw and maintain a context diagram that describes the interfaces to the problem space

If you define the boundary to the problem space then you know that everything you specify has to fit within that boundary. Try to write a specification for a system without a well-defined boundary is going to encourage scope creep.

How does one specify a system boundary? You identify the interfacing actors, (systems and users) and you write an interface specification for each one. The interface specification states exactly what is going into the system and what is being output by the system.

2.5.1 Completed Edge To The Puzzle



This diagram shows that we have specified the boundary to our jigsaw puzzle. We know from this point on that every piece of the puzzle fits somewhere inside this boundary.

A piece is missing in order to demonstrate that no boundary is going to be fully defined prior to development.

[Better pictures to follow.]

2.6 Organize The Requirements

- Start putting together pieces of similar color and texture to form of the picture
- Puzzle objects represent use cases (or similar requirements tool) that describe a set of related requirements
- The objects are not necessarily consistent with the departments from which the pieces were solicited
- Requirements from many areas may be combined into a single object (use case)

Start putting together the groups of a similar pattern that we identified earlier.

Pieces that go together did not necessarily come from the same area of the business.

For example, a use case describing a sales person making a change to a product will have security implications; will include functionality gained from the sales department and requirements defined by the financial department.

2.6.1 Initial Puzzle Objects



The picture shows partially created objects in the puzzle. Each object represents a piece of functionality that may be captured by a use case. Objects come in different shapes and sizes.

The picture shows that 4 use cases have been identified.

2.7 Analyze The Requirements

- Use case analysis involves putting the component pieces of the puzzle (use cases) together inside the boundary edges of the puzzle (context of the problem space) in such a way that they form a complete picture
- When components are linked there will be spaces between them and maybe even some mistakes in the making of those component parts
- Fixing these problems is the final part of requirements analysis; use cases alone will not provide a complete solution to the problem
- Use cases should be connected using a combination of class, state and sequence diagrams to show inconsistencies, errors and missing requirements

Complete the use cases by connecting them to the interfaces defined earlier. This ensures that no scope creep occurred and that no functionality is missing.

For every input or output identified in the interface specifications, 1 or more steps in the use cases should use that interface item. Any steps that do not have a corresponding interface specification should be investigated as to whether they are out of scope or detailing non-essential functionality.

[An example of non-essential functionality would be specification of a design decision. For example, stating that the system must store customer profile data in non-volatile memory is probably not a requirement.]

Finally the use cases are connected by filling in the gaps between them with the left-over pieces. This is the hardest part of the analysis process and returns the least amount of requirements for the effort expended. Connecting use cases requires some level of formal modeling. That means going some way towards making an executable requirements model.

[Many, if not most, analysis efforts will stop the process when the use cases are produced and consider the requirements specification to be 'good enough' at this point.]

[See the book, Analysis Through Pictures, by Leslie Munday for more information on formal requirements modeling.]

2.7.1 Objects Positioned Inside The Edge



The picture shows well-defined objects connected to interfaces defining the scope of the puzzle. Filling in the interior pieces that connect the use cases is beyond the scope of this presentation. [Apologies if the pictures are having a ‘fuzzy’ effect on the eyes by this point.]

2.8 The Completed Puzzle

- Producing a puzzle completion of 90% is an almost always 'good enough'
- Even the first deployment of a complete system (after development and testing) is often acceptable with 90% satisfaction of stakeholder requirements
- Remember that Business Analysts do not get to see a picture of the complete puzzle until after it is deployed

The previous picture represents a pretty good requirements specification, with close to 90% of the pieces placed in the puzzle.

Remember that unlike the jigsaw puzzle analogy, the picture of the solution is in the minds of the stakeholders for the project. It is the analysts job to get those pictures out of the stakeholders in the form of pieces of the puzzle and put them together to form a near complete and consistent picture of what the final solution will look like.

2.8.1 A Nearly Complete Puzzle



The above picture represents a best shot at a requirements specification even after creating a completely formalized executable model.

Some requirements will just never be found until a user of the system comes across a feature that requires a workaround.

Beware of 'analysis-paralysis' – a term used to describe finding those almost impossible to find requirements. Stop when the picture is 'good enough' to work with.

3 Summary

- No specification is ever perfect. We work from a ‘best guess’ of the problem
- The business analyst creates a specification of the problem through soliciting, analyzing, reviewing requirements and repeating the process
- Discover actors (both people and systems) that define interfaces, early
- Build incrementally by specifying objects in the picture one at a time
- Locate hard to find objects before building the easy objects

I showed this presentation to an English teacher with almost no experience of IT. She now has a much better understanding of what it is that I do. Trying to explain the job of a BA in terms of actual artifacts (use cases, requirements, specifications), is extremely difficult to the average person.

If you as a Business analyst find yourself needing to explain what it is that you do to someone with no grounding in analysis, you too might find the example of a Jigsaw is a good place to start.