Goal sketching and the Business Case

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Abstract

This paper describes how the business case can be characterized and used to quickly make an initial and structurally complete goal-responsibility model. This eases the problem of bringing disciplined support to key decision makers in a development project in such a way that it can be instantiated quickly and thereafter support all key decision gateways. This process also greatly improves the understanding shared by the key decision makers and helps to identify and manage load-bearing assumptions.

Keywords: goal-oriented requirements engineering,  
project management, agile development.

1. Introduction

Our motivation for goal sketching [1] is to help stakeholders who need to make project critical decisions in projects which develop evolving systems. Agility is needed in the manner of obtaining and maintaining the rationale of problem and solution requirements so as to be able guide development projects. In [1] we state four objectives concerning 'just enough' precision to help the key decision makers to set and manage stakeholders' expectations and nurture shared understanding. Critical to success is being able to instantiate this support as close as possible to the outset of the project and ensuring that the methods can be easily adopted by project managers as well as analysts. We have also reported in [2][3] that forming goal refinement arguments can be more difficult for such practitioners than the simplicity of the concept of stepwise goal refinement would suggest. Aids are needed. In [3] we showed that goal oriented refinements of functional requirements can be accelerated using simplified activity diagrams.

Getting started with a stable, initial goal sketch can also be problematical. Heuristic help can be expected to accelerate the process. We have found that this can be provided effectively when a project is firmly related to its business case.

In this paper we show for a common class of business cases that the part of the business case that is crucial to the existence of the project can be formulated in the format of what we call a concise business case. This is built up of goal oriented propositions (GOPs) that constitute the elements goal sketching [1]. By pressing for structural completeness of the goal sketch the load-bearing assumptions [4] and constraints are raised into prominence and juxtaposed to facilitate a clear understanding of the current threats to the project's capacity to satisfy its justifying business case. It should be noted that there is no assumption that a single immutable business case is created at the outset. It is simply asserted that the purpose of the project is to deliver products that satisfy the business case at the time.

This paper proceeds with Section 2 outlining goal-responsibility (G-R) models as used in goal sketching. Section 3 introduces the concise business case template which is then expressed as a goal-sketch in section 4. Experience of real projects is reported in section 5. Section 6x presents related work. Ongoing work is discussed in section 7 and conclusions are presented in section 8.

2. Goal-Responsibility Models

An example goal-responsibility model is shown in Figure 1. The figure and the explanation provided here is abstracted from [1].

Each box in Figure 1 is a 'goal oriented proposition' (GOP). There are goals, assumptions and constraints. In this example P is satisfied by the combined soundness of A,Q and R, R is satisfied by actors 1 and 2 taking necessary joint and collaborative responsibilities. Similarly Goal Q is satisfied by C,S and T where S and T are satisfied by actors 1 and 3.
respectively. C is a constraint which will be satisfied by the definition of a ‘rule’ for cross-cutting the responsibilities of actors [1]. In this example P is a single root and A,C,S,T and R are the leaves of the G-R model. Note that the necessary behavior (and other qualities) that must be instantiated is described only at the leaves of the model; it is not distributed across the model.

![Figure 1. Goal-Responsibility model](image)

A structurally complete G-R model is one (such as Figure 1) where: all goal leaves are guaranteed by responsible actors and constraints are guaranteed through cross-cutting rules. The only leaves not guaranteed are assumptions which must be trusted.

The skill of the analyst is to organize the GOPs into a structurally complete and persuasive stepwise argument. This discipline is a powerful aid to understanding what is known about the requirements and their preferred satisfaction. It allows the analyst to guide the setting of expectations among the stakeholders. For example in order to achieve structural completeness the analyst may need to add GOPs as “TBD” (to be determined) or to add an assumption. These moves reveal the absence of information and vulnerable assumptions and thus point to the relative risks in setting any expectations on the current understanding.

8. The Concise Business Case (CBC)

Major project management methodologies emphasise the temporary nature of a projects and their continued existence justified by a viable business case; see [5], [6] and [7]. Taking PRINCE2 as an exemplar a project is (Figure 2):-

*A project is a temporary organization that is created for the purpose of delivering one or more business products according to a specified business case [7].*

![Figure 2. Definition of a project](image)

Business products (aka specialist products [7]) define the intended outcome of the project. A product may be all or part of what Alexander calls *kit* [8] or an accomplishment such as completing the training for a group of staff who will be served by the kit. At the heart of the definition in Figure 2 is the requirement that these products satisfy a business case. It follows then that the requirements, or acceptance criteria, for the products should be traceable to the business case. One way of assuring this is to create a G-R model such as Figure 1 to represent the business case roots, constraints and assumptions and placing the products that are to participate in the live system among the actors.

In order to proceed the business case must be distilled and rendered as an appropriate set of goal oriented propositions. Once this is done the benefits of the discipline of structural completeness may be obtained.

A business case typically includes a promissory part and a rationale justifying the investment needed to accomplish it. Under the definition (Figure 2) it is the promissory part of the business case that concerns the project. Bearing this in mind and considering projects which we have observed (system & product development projects and investigation projects) we have postulated certain characteristics and summarize them in Figure 3 in what we call the concise business case template.

Subject to the validity of certain assumptions it is agreed that it is a sound investment proposition to realize certain benefits through the development of products which will satisfy the concerns of a given ‘customer community’ and must be accomplished within defined constraints on time, cost and prescribed approach.

![Figure 3. Concise Business Case Template](image)

The underlined text affords a basis for structuring the promissory part of the business case as a set of goal oriented propositions; the motivations (m*), behaviors (b*), constraints (c*) and assumptions (a*) described in [1]. This may be more easily visualized through a[5]
Goal Frame (see [1]) as shown in Figure 4.

![Figure 4. Concise Business Case as a Goal Frame](image)

In Figure 4 the large box represents the target domain of the project which here (and according to Figure 3) contains two sub-domains: the products to be produced and the customer community. Usually in practice both of these domains are decomposed into their own sub-domains.

The benefits in Figure 3 appear in Figure 4 mostly as motivation goals at the top of the frame but there may also be motivations involved in satisfying [9] the concerns of customer community. The assumptions in Figure 3 appear in Figure 4 mostly as load-bearing assumptions (holding up the frame at the bottom) but there may be further assumptions involved in the concerns of the customer community. The constraints and approach in Figure 3 appear in Figure 4 mostly as the constraints on each side of the frame (containing it) but again there may be further constraints emerging through the concerns of the customer community.

A simple illustration adapted from the zoo turnstile example in [10] serves to demonstrate the above ideas: The sponsor is the management of a zoo who believe that it is worth the investment to develop a computer-controlled turnstile guarding the entrance to their zoo. Their concerns therefore relate to an application domain involving the public and their interaction with the zoo. The GOPs in the business case could be those shown in Figure 5.

Assumptions:
- Admission to the zoo is through one gate alone. /a1/
- Revenue is being lost by visitors evading payment. /a2/

Benefits:
- Increased profit for the Zoo /m1/
- Control of admissions /m2/

Concerns to Satisfice:
- Safety of the visitors (Emergency services) /m3/
- No additional workload (Staff) /m4/
- Easier reporting of visitor statistics (Staff) /m5/

Defined Constraints:
- The new system shall be operational by 1st April 2009. /c1/
- The development resources are X. /c2/

Approach:
- Develop a computer-controlled turnstile guarding the entrance to the zoo. /c3/

![Figure 5. The GOPs for the Zoo Project](image)

4. G-R Model for the Business Case

A structurally complete goal refinement model for the concise business case in Figure 3 is shown in Figure 6. Because of the lack of detail in Figure 3 the completeness of the G-R model depends, as anticipated in section 2, on added assumptions and TBDs.

![Figure 6. Structurally Complete G-R model for the Concise Business Case](image)

The goal responsibility model in Figure 6 reads from left to right. The nodes without type indicators (such as 'global constraints') are inserted as grouping nodes to make the reading easier.

In order to make Figure 6 structurally complete a set of assumptions were added to the effect that there are no other known concerns at each level of refinement over and above the concerns explicitly addressed. Such assumptions can provide a powerful challenge to the stakeholders and this helps the elicitation of technical and project requirements. A single behavior goal (/b/) has been added as a place
marker and is yet to be determined (TBD) in detail. This behavior must be terminated with defined responsibilities to guarantee it.

If the project board trust the assumptions in Figure 6 and believe that its TBD can be safely resolved some time later they may judge that enough analysis has been completed; there is enough precision where it is needed and the assumptions are sound. However it would be difficult on the basis of Figure 6 as it stands to have any confidence in setting the stakeholders’ realistic expectations. It is more likely that further analysis would be undertaken to validate or replace the assumptions and clarify the TBD. Completing a structurally complete G-R model with just enough detail and precision to satisfy the project board is an iterative process.

Returning to the turnstile example the GOPs of Figure 5 are laid out in Figure 7.

Figure 7. Structurally incomplete G-R model for the Zoo Turnstile Project

Because of space limitations, the G-R model is not shown in structurally complete form. All of the assumptions are satisfactory (but not necessarily persuasive) from a structural completeness point of view. A rationale for enforcing the constraints needs to be added. They will be handled differently: /c1/ and /c2/ cross cut the project plan and impact on the feasibility of the production of project products (see [11],[1]and Cockburn’s ‘wheel and hub’ [12]); /c3/ is a design constraint that would be testable in any products developed by the project. The motivation goals /m1/ through /m5/ will require refinement into behaviors guaranteed by appropriate actors; as in Figure 6 some of the actors will be those of the application domain and some will be the products.

As a temporary measure Figure 7 could be made structurally complete by adding TBD behaviors and suitable assumptions. As an example, a speculative first analysis is provided in Figure 8 for /m2/.

The behavior /b1/ in Figure 8 is described by a use case which is indicated as TBD. If the project board are content that this can safely be left to the future or to chance in the hands of the developers then no more precision is needed even though the actual project products that will provide machines or props are also TBD.

The goal /b2/ has definite assigned responsible actors in the form of two products (Turnstile and Controller) and people. Again if the project board is satisfied with its use case then no more analysis is needed on this matter and attention can be directed to the outstanding /m2/ through /m5/ and the composition rules for /c3/.

Figure 8. Structurally Complete refinement to /m2/

5. Application

The example application is taken from a project undertaken by a small software product development company supplying tools for use in the UK medical primary care sector. The example is generalized to illustrate the fact that it has already become a reusable analysis pattern [13] to the company. This company is referred to as the supplier in the following example where company and organization names have been changed to safeguard confidentiality.

Example: A Pharmaceuticals company (PCo) wants to provide a software tool that can be installed and used in general medical practices in the UK as a
supplement to their usual medical systems. The tool is intended to access and analyze the electronic records for patients registered with the medical practices who have a particular condition (the cohort of interest in each medical practice). The analysis will show compliance and deviations with nominated best practice care guidelines published by a College of Physicians (CP) and will provide data to be analyzed in a research department at the University of X (UoX) supporting the guidelines. It is a part of the business justification that this will obtain the endorsement of the National Society for the Condition (NSC). A hidden justification is that such acts of educational contribution improve the standing of the PCo among the healthcare professionals. A pharmaceutical industry regulatory body (RB) gives strict rules that the PCo must obey when interacting with the practices and the National Health Service (NHS) regulates codes of confidentiality in regard to the access and use of patients’ data.

The sponsor is thus the PCo and the Customer Community includes the doctors, the CP, the Regulators (RB and NHS). The application domain is the medical surgeries with their staff and standard medical computer systems. The complete Customer Community Domain (see Figure 4) is shown in Figure 9. Each of the sub domains harbours people with concerns which will be satisfied by the project’s products alone and/or in collaborations with actors from the sub domains.

<table>
<thead>
<tr>
<th>Domain of Customer Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHS</td>
</tr>
<tr>
<td>RB</td>
</tr>
</tbody>
</table>

Figure 9: The Customer Community Domain for the PCo Project.
(Note: the * means many like domains)

The sponsor requires the supplier to provide the tool. Crucially the sponsor is not acquainted in detail with the normal working practices in a medical practice and with the many eccentricities of the different medical computer systems that are used. This knowledge is contributed by the supplier. As a result the sponsor has a business case that requires the satsficing of a customer community over concerns that are not appreciated by the sponsor. The concise business case is shown in Figure 10.

Assumptions:

- The best practice guidelines would be adopted more rigorously in the medical centres if they could be made more accessible./a1/
- Support for the guidelines is not and will not be provided as a part of the normal behavior of the standard medical systems./a2/
- The supplier knows how to satifice the normal working needs of the intended users /a3/

Benefits:

- Enhance the PCo’s standing appropriately with healthcare professionals/m1/
- Contribute to the evidence base for the Guidelines/m2/

Concerns to Satisfice:

- Satisfy the regulators concerns. /m3/
- Provide a practical service to help the doctors manage the care for their patients in the cohort of interest. /m4/
- Collect suitable data for onward supply to the Guidelines research centre./m5/
- Satisfy all brand and commercial presentation concerns /m6/

Defined Constraints:

- The tool shall be operational by 1st April 2009. /c1/
- A fixed price development fee of £X. /c2/

Approach:

- Develop an independent software tool that can be worked cooperatively with standard medical computer systems /c3/

Figure 10. The GOPs for the PCo Project

An initial structurally complete G-R model was constructed from Figure 10 but is not reproduced here due to space restrictions. Six low precision TBD and assumption GOPs were needed to establish the initial structural completeness. For the most part the assumptions and TBDs could not be accepted by the stakeholders. However after a couple of cycles of iteration involving discussion and the goal sketching techniques outlined in [1] just enough precision was established to make proceeding on some parts of the development acceptable to the stakeholders (e.g. the
refinements of /m3/, /m5/ and /m6/) whilst other parts (e.g. the refinement of /m4/) needed to be analyzed further before proceeding.

The experience provided interesting observations:-

1) Although the technique was established to accelerate goal sketching on new problems this approach has (as mentioned above) become the standard pattern used by the company on its development projects.

2) The resulting G-R models appear to focus from the start on the assumptions that are load-bearing and vulnerable [4] and this can readily lead to assumption based planning [4] with its recommended 'hedging' and 'sign-posting' tactics.

3) As anticipated when discussing Figure 6, the assumption 'no known further assumptions' and the need to impose provisional TBPs provoked keen attention to the assumptions and consequently increases the understanding shared by the stakeholders.

Other Examples: The concise business case has been applied to other soft projects. For example a recent project between a major enterprise architecture service company and the University of Reading showed that the methods described here can be used to bring focus to a project as a whole and to stages (e.g. sprints) of the project.

6. Related Work

This G-R modelling has antecedents in KAOS [14] and there are many applications in business process modelling [15]. Similarly 1*, problem frames and business processing can be combined to model business strategy with goal oriented analysis [16]. These approaches offer potential rigor and precision but are not specialised to the business case and do not satisfy the 'lightweight' objectives of goal sketching [1]. The use case techniques of goal oriented requirements engineering primarily concern the functional behavior and the outcome guarantees; even when Cockburn's 'wheel and hub' [12] is accounted for many more project concerns remain to be managed. The same arguments may be levelled at the available use case patterns [17].

As goal sketching [1] espouses just enough precision for managing expectations and enriching stakeholder negotiation by raising the level of shared understanding it also provides a summary viewpoint that he can used alongside the appropriate best practice requirements engineering and project management techniques.

In regard to project management oriented work the assumption based planning methods of [4] and product based planning (PBP) [7],[18] might beneficially be incorporated. The assumptions identified by working from the concise business case and enforcing structural completeness of the G-R model are conveniently laid out for management using 'hedging' and 'sign-posting' tactics [4]. The elicitation of assumptions can be helped by the identification of weltanschauungen using soft systems methodology [19]. Again the overview oriented viewpoint espoused here can support and be supported by established good practice.

**Product Based Planning (PBP):** In principle the scope of a project is defined by the sum of its specialist products. Thus with the inclusion of 'management' products (project plans, contracts etc) all the expected contributory effort to a project can be estimated; at least in principle. However this is only true in practice when what is to be done and how it is to be done are both clear (such as the 'painting by numbers projects' in [20]). But when the situation harbours considerable uncertainties about what and how (as in Figure 8) then it is said to be 'in the fog' [20]. Setting realistic stakeholder expectations (including the eventual satisfaction of the business case) is then problematical and would need the investigative methods of requirements analysis to discover the what while technical invention may be needed to accomplish the how.

The methods in this paper will offer their best return on investment with projects which have invention and/or discovery as prerequisites to their conclusion. In terms of the classifications in [20] they are the projects with a preponderance of 'quest' (clear what and unclear how), 'movie' (clear knowledge of how but unclear what) or 'in the fog' (unclear about what and how). These situations are typical of, but not limited to, projects where Agile methodologies apply. In the wider project management community they can be recognized as soft projects [21].

7. Conclusions and Further Work

We have shown how goal sketching can be accelerated by introducing a template concise business case and have corroborated our expectation using industrial examples. It is possible that the template will be found to be one in a family of templates. We are nevertheless confident that there is an underlying analysis pattern. choose a template, map the business case to it and transform that into a structurally complete
G-R model by adding such assumptions as necessary.

The pattern is most effective for soft projects with uncertainty about what and how. Otherwise best practice project management methods (e.g. PBP) would be advised. The pattern appears to have a fractal nature: It can be applied to the whole project or to its stages (or agile sprints). More work is envisaged to test this.

It appears that the use of the concise business case begins a goal refinement process that is business case oriented in which techniques such as use case goal refinement can be one part.

It was expected that the analysis pattern would nurture improved shared understanding among the stakeholders. Early signs are that this is indeed the case. Most importantly it focuses on the assumptions that are being made and this has a good synergy with assumption based planning. This matter will be investigated further.

The techniques do not compete with best practice requirements engineering and project management. Instead they compliment these techniques and might best be considered as a digest of what is known and providing a project board's viewpoint.

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