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Feasibility Assessment Framework (FAF): A Systematic and Objective Approach for Assessing the Viability of a Project

J K Ssegawa[a]* M. Muzinda[b]

[a]*Department of Civil Engineering, University of Botswana, P Bag 0061, Gaborone, Botswana*
[b]*Innolead , P .O Box 80321, Gaborone, Botswana*

Abstract

The objective of this article is to discuss the Feasibility Analysis Framework (FAF) as an effective approach to conducting a feasibility study for producing a robust project proposal. The approach is based on key information provided in a project business case developed using the Project Domain Framework (PDF). The PDF is as an alternative model in project management that systematically and logically facilitates the writing of a business case at the project initiation phase. To complement the development of a proposal the FAF has been developed to systematically and objectively produce an effective feasibility study. The FAF is a six step framework, developed using action research strategy that involved over 20 client assignments for a period of five years. The article discusses its concepts and application using a simple but practical real case study. Using the case study it demonstrates how project alternatives and options may be generated, objectively analyzed using weighted the TELOS criteria to confirm the viability of the project by determining whether it will overcome legal, technical, economic and operational requirements in a desired time limit. The process culminates in the accept or reject recommendation.

Keywords: feasibility study, business case, project viability, project initiation, TELOS, PDF

* Corresponding author. Tel.: +267-71498140
E-mail address: ssegawaj@mopipi.ub.bw

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1. Introduction

Modern organisations use projects to establish new or improve existing services. From a client perspective, the initiation phase is critical to project success as it forms the basic elements expected during the operation of a service [1]. The initiation phase consists of four key stages namely the business case, feasibility analysis, project proposal and project charter [2,3]. As a high-level document, a business case provides information for stakeholders (e.g. management, sponsors, beneficiaries, etc.) to react to the possibility of translating a conceived idea into a fully-fledged project by assessing its alignment to strategy, desirability by the intended target group and its high level risks and constraints [4,5]. When there is a *prima facie* case, key stakeholders normally demand that a feasibility analysis (study) be conducted for a detailed evaluation to ascertain the viability of a project. As a third stage, the project proposal underscores the fact that divisions of an organisation conceive various ideas for which they request funding yet budgets are limited. This implores organisations to select and fund, from a pool of proposed concepts, the most strategic and value-adding projects [6]. The last initiation stage leads to the drawing-up of a project charter and selecting a project team to implement the project and hence establish a or improve a service [4,7]

The need to produce an effective business case led to the development of the Project Domain Framework (PDF) described in two seminal articles [4,8]. As an alternative approach in project management, PDF is aimed at facilitating the systematic and logical development of a business case at the initiation phase. PDF is made of two components (i) project basic identification information (PBII) and (ii) the four project domains as illustrated in Figure 1 [4]. Specifically, the project domains answer four key questions namely: *What is the problem (need) of the target group*? – The Problem Domain (PD); *What actions (objectives) are needed to change the situation?* - Action Domain (AD); *What results are desired to indicate a change in the situation?* - Results Domain (RD); *How is change (results) measured*? - Measurement Domain (MD). When the domains are populated with project specific information, a robust business case is developed (see example in Table 3).

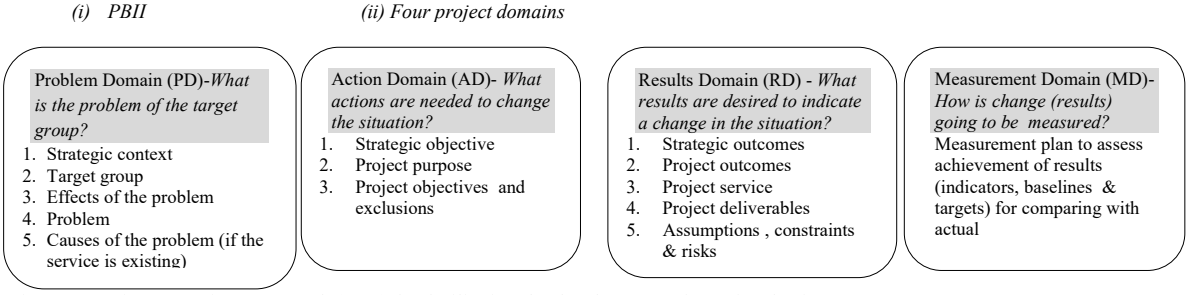

Figure 1: Project Domain Framework (PDF) for facilitating the development of a project business case
Source: [4]

As already noted the PDF was intended to guide the development of a business case. As a follow up, authors found it necessary to develop an effective approach for conducting a feasibility analysis. Despite the uniqueness of projects, feasibility analysis process has common themes that are applicable to most of the project situations and hence the motivation for the proposed Feasibility Analysis Framework (FAF). This article therefore, discusses the FAF as an outcome of a validation study that was guided by the research question: *how can* the *project feasibility analysis process be conducted systematically and objectively using the information from a PDF based business case?* The rest of the paper is divided into four sections. The second section of the paper reviews literature relating to the feasibility analysis process. The third section describes the research approach used in developing the FAF. The fourth section discusses the application of FAF based on real case study and its implication to project management. The paper ends with a conclusion.

2. Feasibility Analysis Process

2.1. Nature of feasibility analysis

Feasibility analysis is a management decision tool that assesses the viability of a project concept to enable an

organisation to decide whether to go ahead with a project concept or to reject it and hence avoid wasting resources. The feasibility analysis identifies and evaluates alternative ways of delivering the project service; assesses each alternative to identify the most optimal in terms of being doable, viable and one which will overcome the associated legal requirements. Feasibility analysis finally produces a reasoned recommendation, to accept or reject with the proposed project concept. In the process it assesses whether the benefits exceed the cost of implementing the project concept [9, 10]. Some scholars (e.g. [9]) observe that feasibility analysis should proceed in two major stages, the (i) preliminary or pre-feasibility and (ii) the detailed or full-feasibility. The authors' observation is that the PDF approach (and the resultant business case) is equivalent to a preliminary or pre-feasibility process (see Figure 1) while the FAF process is a detailed or full-feasibility study. The two stages essentially indicate the depth of investigation and hence the extent to which project information is increasingly elaborated. Dividing feasibility studies into the two stages is in line with the principle of avoiding wastage of resources.

2.2. Generation of alternatives

A business case proposes a baseline solution. During the feasibility analysis alternative solutions to the baseline are generated including the 'do-nothing'. An alternative could be an entire mode of delivering a service e.g. power could be generated using thermo-powered generators as a baseline while alternatives could be solar, wind turbines, nuclear or hydro-electric. All the alternatives need to be evaluated to obtain an optimal solution in what is called an *inter-alternative* analysis. Furthermore, a service consists of a set of integrated deliverables. Once an optimal alternative is identified, its deliverables could be analysed to generate various options in a process called *intra-alternative* analysis. Suppose the optimal alternative for generating and distributing power is by solar panels but one of the deliverables is how to charge customers for power use. Two options could be generated, charging customers based on post-paid or pre-paid basis. These two options could be assessed to an optimal solution. Therefore, both inter- and intra –assessments are necessary for an optimal solution.

2.3. Feasibility analysis areas

Determining an optimal solution requires evaluating the level of risk, cost and benefits of alternatives/options based on several feasibility areas. Literature sources do not seem to agree on the number of areas. However, there is some convergence on five generic areas known as TELOS (technical, economic, legal, operational and schedule) indicated in Table 1. The sequencing of areas in the list does not necessarily prescribe that the assessment proceeds in a linear fashion. Like most project management processes feasibility analysis is iterative. The authors' practical experience indicated that it is often useful to start with 'technical' and end-up with 'economic' assessment. The technical choice affects all other areas while all feasibility areas affect the economic assessment.

Table 1: Areas of feasibility analysis and their purpose

TELOS area	Objective
1. *Technical* -	Assess alternatives for buildability, functionality/performance, reliability/availability, capacity and maintainability
2. *Economic*-	Assess whether benefits exceed costs using appraisal methods (e.g. CBA, breakeven, NPV, IRR or payback)
3. *Legal*-	Determine project's ability to surmount various regulatory and ethical requirements (e.g. EIA, permits, etc.)
4. *Operational*-	Determine the project's synergetic environmental fitness (e.g. culture, structure, systems, policies and stakeholder acceptance).
5. *Schedule*-	Assesses whether the alternative/options can be completed within desired or mandatory time

Source: [11,12]

Some sources [12] have noted that the uniqueness of a project may require that the feasibility areas are weighted to show their relative importance in the analysis. A typical example is when a project has a mandatory delivery date then schedule feasibility may be weighted more than other areas. In addition, when evaluating two or more alternatives/options where the TELOS attributes are subjective, it may require developing an assessment rubric encompassing a scale such as *Very high (4)* to *Very low (1),* for example, if we consider two options to be evaluated on schedule feasibility, then we may use the scale to assess the chance of completing them in a required time. However, for economic feasibility we may assess the benefits and costs in monetary terms over the economic life of a service. Furthermore, for the analysis to be presented in a comprehensible manner, a feasibility analysis matrix [9,10] is often used as demonstrated later.

Other assessment areas that are mentioned in literature include marketing and social feasibility [14]. The position of this article is that marketing feasibility should be dealt with during the marketing research analysis which forms part of the development of a project business case. On the other hand the social criteria may be added as the sixth criteria to form TELOSS especially where the project is non-profit in nature. Some operational areas such as the political, cultural and environmental feasibilities may be covered appropriately under operational or/and legal feasibility assessment and hence do not require separate headings (see Table 1). Another area mentioned in literature was financing feasibility [9,16] which deals with how a project should be funded, the funding sources and associated financial costs. It is noted here that this should be dealt with post-feasibility analysis when a project budget has been estimated from the economic feasibility appraisal and considered only if the results indicate viability.

2.4. Steps for used FAF Approach

The FAF approach provides a six-step systematic approach for conducting a feasibility analysis namely*: Step1* – review the business case to develop a work breakdown structure (WBS) that defines the high level scope for a project*; Step 2*-Determine the TELOS or TELOSS weights; *Step 3*-Generate alternatives and/or options; *Step 4*-Carry out an *inter* and *intra* alternative analysis using a specific formulated criteria based on TELOS*; Step 5* – determine optimal options and alternatives*; Step 6* – Write a report recommending the acceptance of an optimal alternative or rejection of all alternatives (i.e. accepting the 'do-nothing' alternative).

Table 2 shows a guide for completing Step 6 which was synthesised from literature and validated by the authors' practical experiences and forms part of the tools used in the FAF approach. The table shows the sections of a feasibility report narrative whose key contents are derived from the first five steps indicated above.

Table 2: Typical sections and contents of a project narrative of a business case

Feasibility Analysis Report Sections	Contents of the sections
A. Preambles	Cover page with project information, acknowledgment, executive summary, contents & abbreviation list
B. Introduction	Feasibility purpose, objectives & scope, oversight/audience, methods, data sources and period of analysis.
C. Organisational/problem background	Organizational context, the current situation, those affected, what has to be changed
D. Baseline solution, results & measurement	Baseline solution (WBS), objectives of the new service and expected results & their measurement
E. Feasibility criteria, generation & analysis of alternatives	Criteria formulation and weighting (TELOS), alternative generation & analysis (optimal solution)
F. Recommendation	Accept or reject project
G. References	Data sources used in the feasibility analysis
H. Appendix	Attachments e.g. project domain matrix, feasibility analysis matrix

Source: [14]

3. Methodology

3.1. Research approach

Action research strategy was used in the research study. Action research allows a researcher to pursue two independent but simultaneous agendas. In the first a researcher acts as a consultant with the aim of solving a client's project related problem [15] while the second agenda involves a researcher attempting to answer a research question. In the latter, data from client similar assignments is collected and analysed over time to answer a specific research question [15].

The development of the FAF was based on several client assignments that spanned a period of over five years after the development of the PDF. The assignments were carried in three countries, Botswana, Namibia and South Africa. As of now the FAF framework has successfully been used on over 20 projects both in the profit and non-profit oriented environments. The XHB Project, who Project Domain Matrix ($Proj_{mat}$) is shown in Table 3, is used to discuss the application of FAF. Though the project is simple, it demonstrates the principles of FAF.

Table 3: A summary ($Proj_{mat}$) of the business case for the XHB Project

Project Basic Information (PBII)					
Project Name: XHB Project; Project Code: HRD/XAU/2015 Problem /Project Location; Xau; Business Case Initiation Date:03/2015; Business Case Approval Date:05/2015		*Key stakeholders:* Sponsor: Dept. of Operations; Project Champion: Mrs Zodwa; Financier: HarBuild; Target group: Xau Community, *Other stakeholders*: Potential service providers, local authority, community leaders, etc.			
Problem Domain (PD) *What is the need (challenge or problem)?*	Solution Domain (SD) *What actions are needed to change the situation?*	Results Domain (RD) *What results are desired to change the situation?*	Measurement Domain (MD) *How is the change (results) to be measured*		
			Indicator	Baseline (05/2015)	Target (11/2015)
Strategic context: HardBuild needs to expand its footprint & market share	*Strategic Goal:* To contribute to increasing HardBuild's footprint and market share	*Strategic Change (or impact):* • Increased footprint in the country • Increased annual sales	• No of branches in the country • % increase in annual sales	• 11 • 3%	• 12 • 5%
Effects and severity of the problem: • Long distance travelled for services • High transport costs • Long delivery lead times • Lack of credit facilities • High number of incorrect deliveries	(no entry)	*Expected Change (or outcome):* • Reduced distance travelled for service • Reduced transport costs • Reduced lead time • Credit facilities availed • Reduced number of incorrect deliveries	• Average distance travelled • Transport per load • No. of days to receive delivery • Existence of credit facilities • % of incorrect deliveries	• 250 km • €1.2/kg/km • 3-5 days • 0 • 10-20%	• 40km • €0.2/kg/km • 0.½-1days • 1 • 0-5%
Problem: An estimated 3,000 Xau potential customers in Xau town lack hardware services	*Project Purpose:* To provide hardware services in Xau town at a cost of €30,000 by the end of November, 2015	*Expected Service:* A hardware service established in Xau town	Hardware service level (Excellent (10)...Very Poor (1)	2.5	8.5
Causes (No entry because the service in not existent)	*Project objectives:* • To develop a hardware shop infrastructure (HSI) by mid-Nov., 2015 • To procure hardware stock by end Nov.,2015 • To hire employees by mid-Nov., 2015 • To install IT systems by end of Nov., 2015 • To sign transport agreements with local transporters by end of Nov., 2015 • To implement a marketing plan for the hardware services by mid-Nov., 2015	*Expected deliverables (or outputs)* • HSI established • Hardware stock procured • Employees hired and trained • IT system installed • Transport agreements signed with local partners • Marketing plan implemented	• Existence of a HSI commissioning certificate by Dept. Operations (DO) • Hardware stock procured • Hired and trained employees • Existence of a working IT system • Signed transport agreements • Marketing plan completed	• 0 • 0 • 0 • 0 • 0 • 0	• 1 • 1 • 1 • 1 • 1 • 1
	Exclusions	*Result Context*			
	Branch employees will not be trained from the project budget but from the central HardBuild's pool	*Pre-conditions/Assumptions* • Availability of an efficient contractor in Xau town • There is no potential entry of a competitor in the next 12 months	*Constraints* • Maximum budget for branch Type C at HardBuild is €30,000 • Maximum period for opening branch Type C is six months after approval		

Source: [4]

3.2. Case study- XHB Project

HardBuild Company provided a service of selling hardware and building materials to clients (for reasons of confidentiality the project's name, location and individuals have been disguised). One of its strategic goals was to expand its footprint, in order to increase its sales revenue, market share and hence profitability. Residents of Xau travelled over 250 km to a regional town to purchase hardware and building materials while more complex purchases were obtained almost 950 km from the capital city. Apart from the high transport costs, the hardware outlets in the regional town did not provide the desired level of customer care to Xau residents. Furthermore, according to the population census of 2011, the population of Xau was estimated at 10,000 and was forecast to double in the next ten years. Apart from the natural population growth, the population was forecast to increase due to the declaration by UNESCO in 2014 that the Xau Delta is the 1000^{th} world heritage site. The local authority, for example, allocated several plots for residential, recreational and commercial developments. HardBuild saw this as an opportunity to establish a hardware store in Xau town.

The Marketing Department (MD) carried out a marking research study and came to the conclusion that Xau town was indeed an opportune location for expansion. It then forwarded the market research report to the Operations Department (OD) and hence the XHB Project was conceptualised by MD in March 2015. The OD developed a business case and in May 2015, it was approved by HardBuild Management. For brevity its contents are summarized in one of the PDF's tools called the project domain matrix ($Proj_{mat}$) shown in Table 3. On approval of the business case Harbuild management requested that a feasibility analysis be conducted to confirm the viability of the XHB Project.

4. Application of the FAF to XHB Project

This section discusses the application of the FAF approach based on the XHB project business case information. However, other information sources were also used e.g. HardBuild strategic plan, HardBuild policy documents, interviews with heads of department of finance, HR, operations and marketing, some key informants in Xau town and knowledge of key trade laws.

4.1. WBS for the XHB Project

The feasibility analysis began with a review of the XHB Project business case followed by the development of a WBS. Six deliverables were identified (from the expected service/deliverables - see shaded cells of Table 3) namely human resource (HR), stock, hardware shop infrastructure (HSI), information technology (IT), transport and promotion as illustrated in Figure 2.

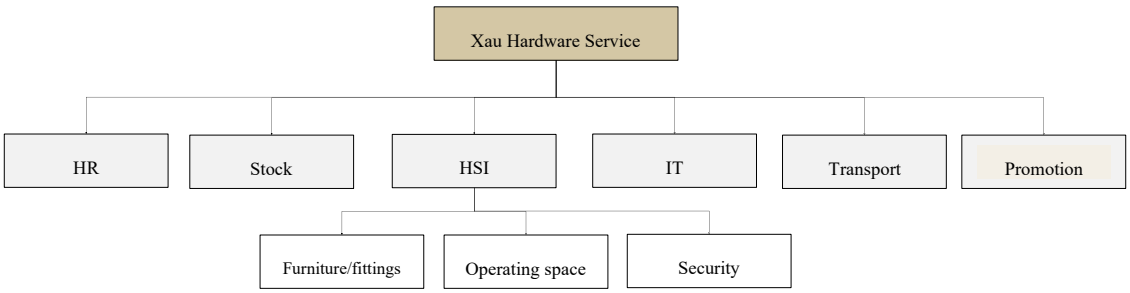

Figure 2: WBS for the XHB Project (baseline solution)

Furthermore and as subsequent step, the feasibility study team agreed on weights for the feasibility (TELOS) areas as follows: 30% for economic feasibility due to the profit oriented nature of the project; 20% for schedule and operational feasibility due to the company policy requirement of delivering rural branches within six-eight months

and the need to deliver an effective service, respectively; and the rest of the feasibility areas (technical and legal feasibility) were weighted at 15%.

4.2. Generation of alternatives and options for the XHB Project

An assessment was conducted yielding only three alternatives, 'do-nothing' (ALT1), 'establish a new branch at Xau' -the baseline (ALT2) and 'purchase an existing store' (ALT3). The latter (ALT3) was immediately ruled out because there was absolutely no hardware store in the area leaving ALT2 and ALT1 (this would be considered after analysing ALT2).

The deliverables of ALT2 were then scrutinised. The stock, transport and promotion deliverables did not yield any options (see Figure 1). Hardbuild's policy prescribed that branches should not own trucks but instead should make transport arrangements with local transporters to deliver customer purchases. It also prescribed that procurement of hardware stock and promotional material and activities should be carried out by head office to achieve economies of scale.

Further assessment revealed that the IT, HR and HSI deliverables had two options each. Options for IT differed in connectivity i.e. IT1 was to connect to a private sector operator while IT2 was to use a public sector operator. Options for HR differed in approach, for example, HR1 required to recruit and train all staff of the branch. This was considered less disruptive but required a longer delivery time and did not guarantee a high quality customer service. Option HR2 required 'poaching' staff from various branches for Xau branch but at the same time recruiting and training their replacement. This was going to be disruptive in the sense that work load would increase in the branches where staff were poached but guaranteed high quality customer service at Xau branch. The HSI had three options mainly due to location and space capacity. Option HSI1 involved locating the shop in Zone A, right in the middle of town. The building had adequate operating space requirements, was convenient to customers using public transport, required only refurbishing and hence delivery time was shorter (two months). However, parking space was inadequate, rent was too high and the lease was also short (three years). Option HSI2 was located in Zone B, some two km from town. The space was not enough and hence required to construction expand the shop (four months), customers without cars needed to take a taxi. However, the rent was lower (40% lower than HSI1) and the lease was longer (five years). Option HSI3, of constructing a new building, was rejected due to company policy.

4.3. Analysis of each deliverables/options

An intra-alternative assessment was conducted on the three pairs of options using the specific attributes mentioned above but grouped under the TELOS framework as summarized in a feasibility analysis matrix, shown in Table 4.

Table 4: Feasibility Analysis Matrix for XHB Project (intra-alternative assessment of options)

TELOS (weights)	IT1 private operator connectivity	IT2 public operator connectivity	HR1 recruit & train employees	HR2 transfer, recruit & train employee	HSI1 Zone A- Refurbish	HSI2 Zone B- Construct & and refurbish	Promotion	Transport	Stock
Technical (15%)	Same =4* **(0.60)**	Same =4 **(0.60)**	Hardware shop knowledge = 2 **(0.30)**	Hardware shop knowledge = 4 **(0.60)**	contractor =4 **(0.60)**	Contractor=3 **(0.45)**			
Legal (15%)	Same = 4 **(0.60)**	Same =4 **(0.60)**	same =4 **(0.60)**	same =4 **(0.60)**	Permits =2;Lease (3yr) =2; Total =4 **(0.60)**	Permits =2; Lease (5yr) =4; Total =6 **(0.90)**			
Operational (20%)	High reliability =4 **(0.80)**	Low reliability =2 **(0.40)**	Customer care = 2;Disruption=3 Total =5 **(1.00)**	Customer care = 4; Disruption =2 Total =6 **(1.20)**	Parking space =1; Client travel =4; Total =5 **(1.00)**	Parking space =4; Client travel =1; Total =5 **(1.00)**			
Schedule (20%)	Install. time =4 **(0.80)**	Install. time =3 **(0.60)**	Delivery time =2 **(0.40)**	Delivery time =4 **(0.80)**	Completion=4 **(0.80)**	Completion=2 **(0.4)**			

Economic† (30%)	Total costs = 2.4 **(0.72)**	Total costs = 4 **(1.20)**	Total costs = 2.8 **(0.84)**	Total costs = 4 **(1.20)**	Total costs = 4 **(1.20)**	Total costs =2.1 **(0.63)**			
Total Score **(Rank)**	Total Score=**3.52** **(1)** √	Total Score=3.40 **(2)**	Total Score=3.14 **(2)**	Total Score=**4.4** **(1)** √	Total Score=**4.20** **(1)** √	Total Score=3.38 **(2)**	√	√	√

The extent to which an attribute can be achieved is Very high (4), High (3), Low (2) Very Low (1) ; †due to space constraints a detailed computation is not shown here but the revenue is the same so the comparison is on the lowest cost which is normalized relative to other options.

Each pair of options was assessed by the feasibility team separately then their scores were averaged. As already indicated a scale of *Very low (1)* to *Very high (4)* was used in assessing the technical, legal, schedule and operational areas. For the economic feasibility total costs (capital and operating costs) were estimated for a five year period (the longest lease period). The lowest cost was given a score of 4 while the highest was given a normalized score which was less than 4. All scores were then weighted and added for all the TELOS areas to get a total score for each option. The pairs were then ranked against each other to determine the optimal option which happened to be IT1, HR2 and HSI1 as shown in Table 4.

To compute the net present value (NPV) of the project (i) total costs were also estimated for the other deliverables without options (i.e. transport, stock and promotion) and complied together with IT1, HR2 and HSI to get the project total cost over the five years. Similarly total revenue for the project was computed for the five years (based on estimates from the marketing analysis report). The net annual cashflows were then discounted using Hardbuild's discount rate of 8% and both the net present value and the payback period were computed. The project yielded an NPV of €495,050 and a payback period of three years and four months.

Two recommendations were made namely to accept the XHB project (ALT2) since NPV was positive and the branch's pays back period was within the required four year period. The second was to reject, the 'do nothing' alternative (ALT1) because the risk of losing the investment is low and yet opportunity foregone will be high (€495,050 in a period of five years).

5. Concluding Remarks

The application of the FAF as a systematic and objective approach for conducting an effective feasibility study has been discussed. The FAF relies heavily on the information contained in a business case developed using the PDF approach. The research was motivated by the authors search for a systematic framework for feasibility analysis and a constant request for the same by clients. Though the discussion has proceeded based on a project with three alternatives (ALT1, 2 & 3), the FAF has demonstrated that a systematic approach to conduct a feasibility analysis. Despite the limited number of alternatives the same process would have been followed if there were more alternatives i.e. conduct an intra-alternative analysis to optimize options for each alternative, followed by an inter-alternative analysis to find the optimal solution. Lastly, a two stage approach to developing a project proposal is recommended, where a business case and the feasibility are separated, hence the use of PDF and FAF framework.

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