G SACAPP PROJECT VISION

G.1 Introduction

The Project Vision, the first and the key artifact of the Inception phase, focused on understanding the scope of the new project (West, 2002); listed high-level objectives and desires within specific boundary conditions; developed first-cut important system use-cases and architectural components that the system had to support; and gave the level of confidence that it was both possible and desirable to develop the new software system (Jacobson et al., 1999).

G.2 Establish the Project Vision for a Hypothetical Company

YTTJC Pty [Ltd] was established in 1953 and since then, it has been engaged in the manufacturing of high quality precision gears, shafts, and gearboxes for use in many industrial applications such as mining, transport services, and aerospace. It made these products from materials such as bars, forgings, and castings, by using various processes, equipment, operations, and manpower according to the process plan sheets. The company owned sophisticated machinery, capable of the complete manufacture, in a discrete manufacturing environment, of all types of high quality gears in the boundary range of 1.5 meters. Also, the company employed people who were in the main, highly skilled and trained in their respective fields of engineering.

The company's management wanted to significantly improve productivity and efficiency of delivery process plans to production, therefore, the challenge was to replace the actual manual system with a CAPP system, used by a maximum of three operators working at any given time, that had to reduce the amount of manual and clerical effort in process planning by automating a number of activities; had an easy environment customisation for process descriptions; had an

easy access to required information; had an accurate and efficient way to build process planning sequence; remain human centred, and had a minimum development, implementation, and training time.

G.3 Identify the Features that the System Must Support

Requirements activity diagram (Figure G.1), the Requirements Plan (Table G.1), and the Feature List (Table G.2) served as key living artifacts for the candidate requirements because new feature requirements arose from project vision, change of requirements, new knowledge, or new ideas that was possible to be turned into real requirements chosen to be implemented in some future release of the system.

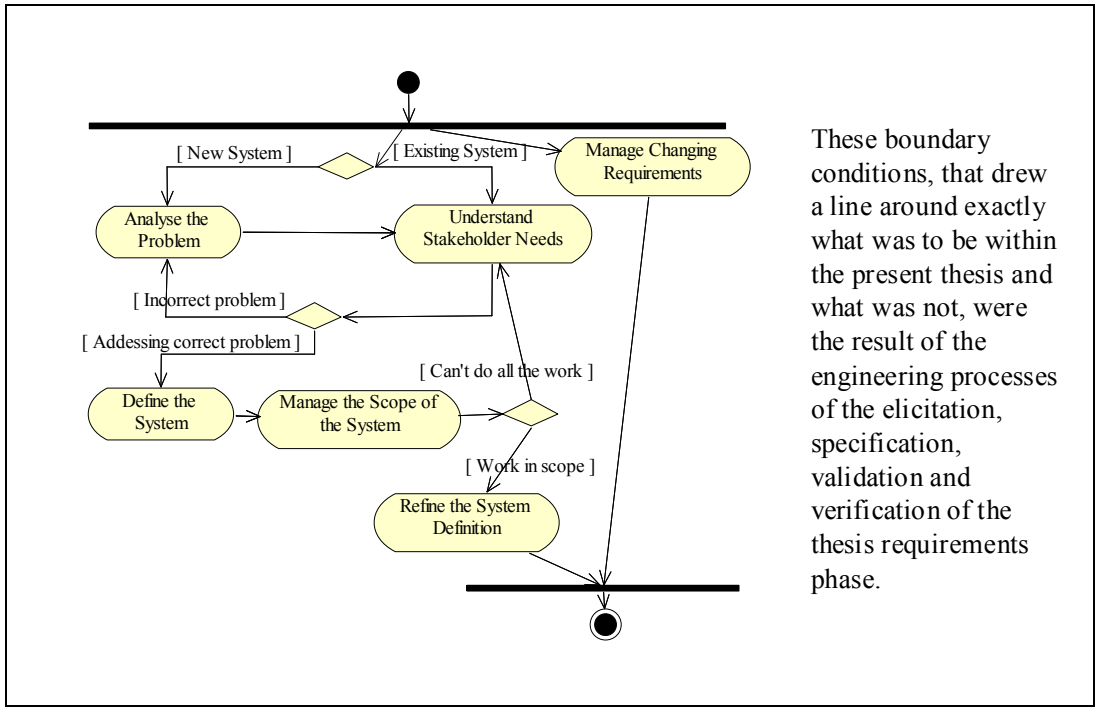

Figure G.1 Requirements activity diagram

G.4 Identify the Actors who will Interface with the System

In finding the SACAPP actors (Figures G.2 and G.3), the thesis considered the following important principles: It would be a mistake to make the assumption that

the actor is a superman or a super-system, and so can cover lots of bases (Vliet, 2000); The design of the system's interfaces must be based on the actors' different roles, which might require different interface skills, knowledge, and comprehension levels (Jacobson et al. 1999); and that an actor participates in a use case or coherent set of use cases to accomplish an overall purpose (Boggs and Boggs, 2002).

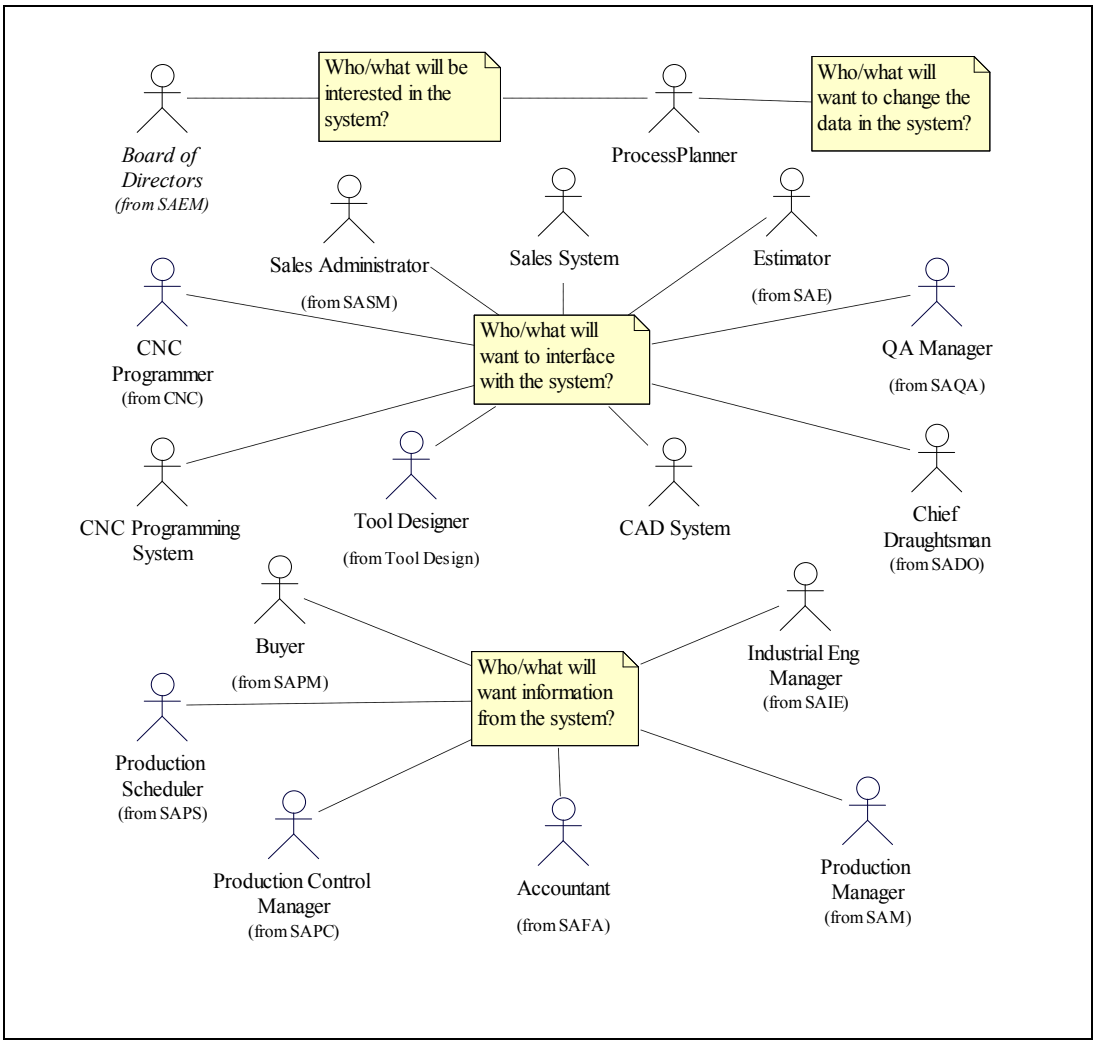

Figure G.2 SACAPP actors: an actor was considered anyone or anything that interacted with the new system, thus stimulating the system and initiating events, or receiving stimuli from the system; once the actors have been identified, the external environment of the system was identified.

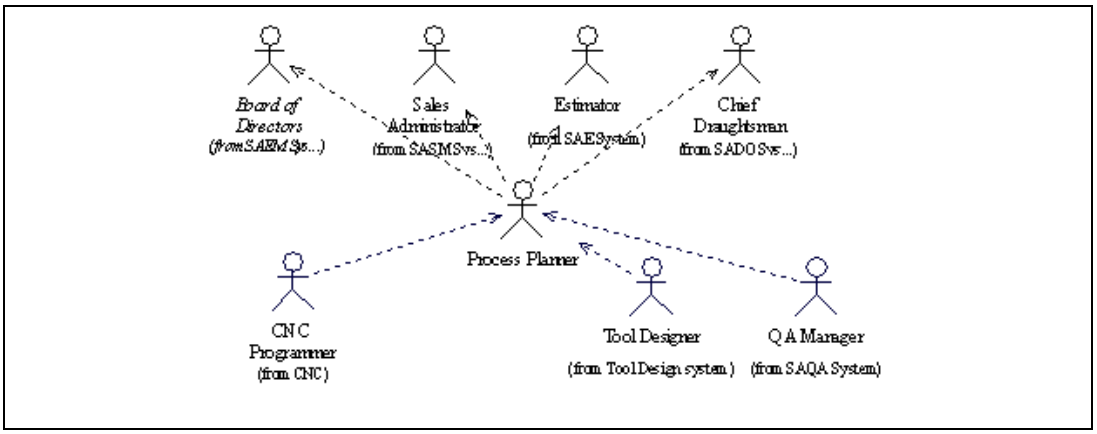

Figure G.3 Process planner dependency association indicates that the process planner depends on other actors

G.5 Identify the Events that the System must be Aware of and Respond to

The events that the system must be aware of should provoke a perceived system response and represent the expectations of the actors. Therefore, in order to have the events under control, a dynamic event table was developed (Table G.3) that was also the catalyst that flushed out use-cases for the new system.

G.6 The Application's Major Use-Cases

Every event had to be satisfied by a UML use-case that focused on what the system will do to provide some measurable value to the actor (Figure G.4, and Tables G.4 and G.5). Once the customer had agreed to the use cases and actors, they agreed to the system scope and its boundaries.

G.7 Identify the Constraints Placed on the Project

The thesis needed boundaries and, a way to express these boundaries coherently was through a number of artifacts, namely the Project Vision and the List Candidate Requirements (Table G.2).

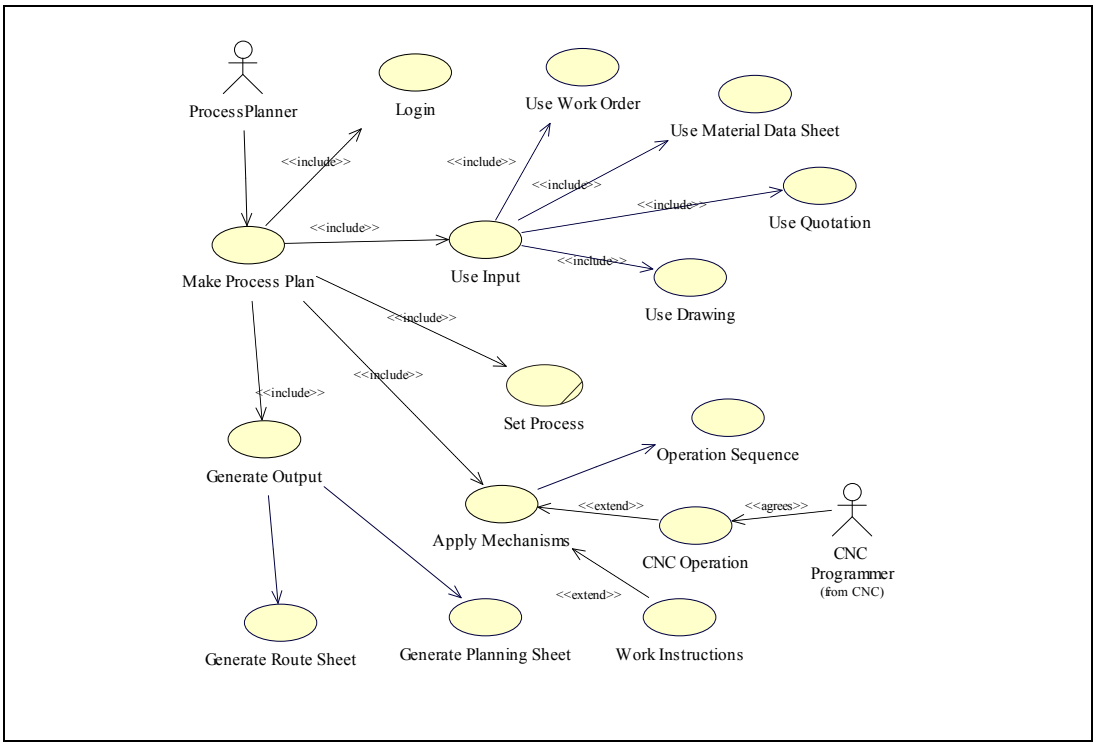

Figure G.4 SACAPP use-case main diagram

G.8 The Project Success Factors

See the Project Vision and the List Candidate Requirements (Table G.2). However, the bottom line of success was considered the possibility to generate near optimum accurate process plans and improve the process planner's productivity.

G.9 Preliminary Execution Architecture

The preliminary architecture in inception phase outlined the most critical subsystems and their interfaces (Figures G.5 and G.6).

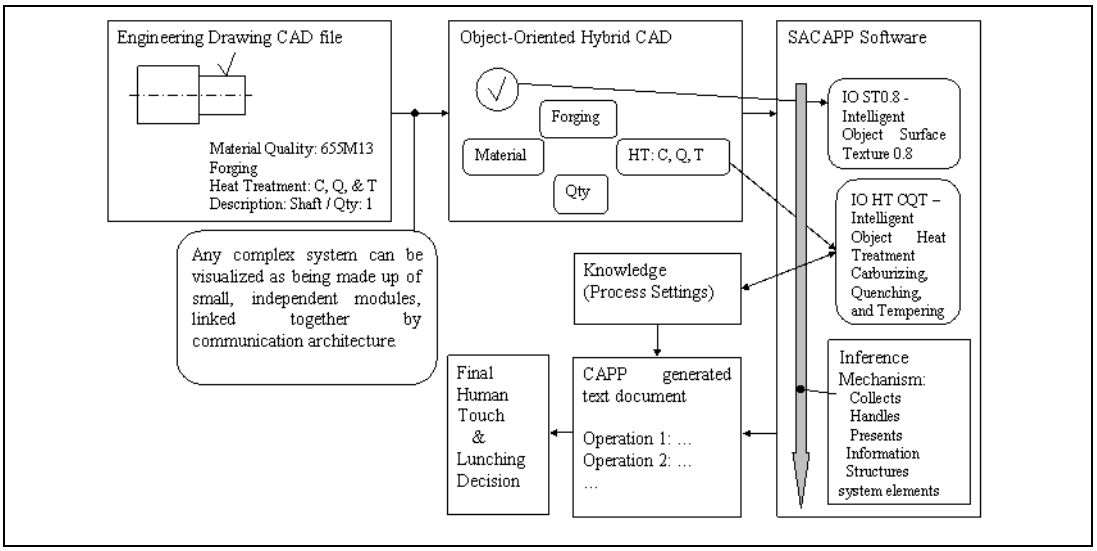

Figure G.5 Design-CAPP interface and some of their operations

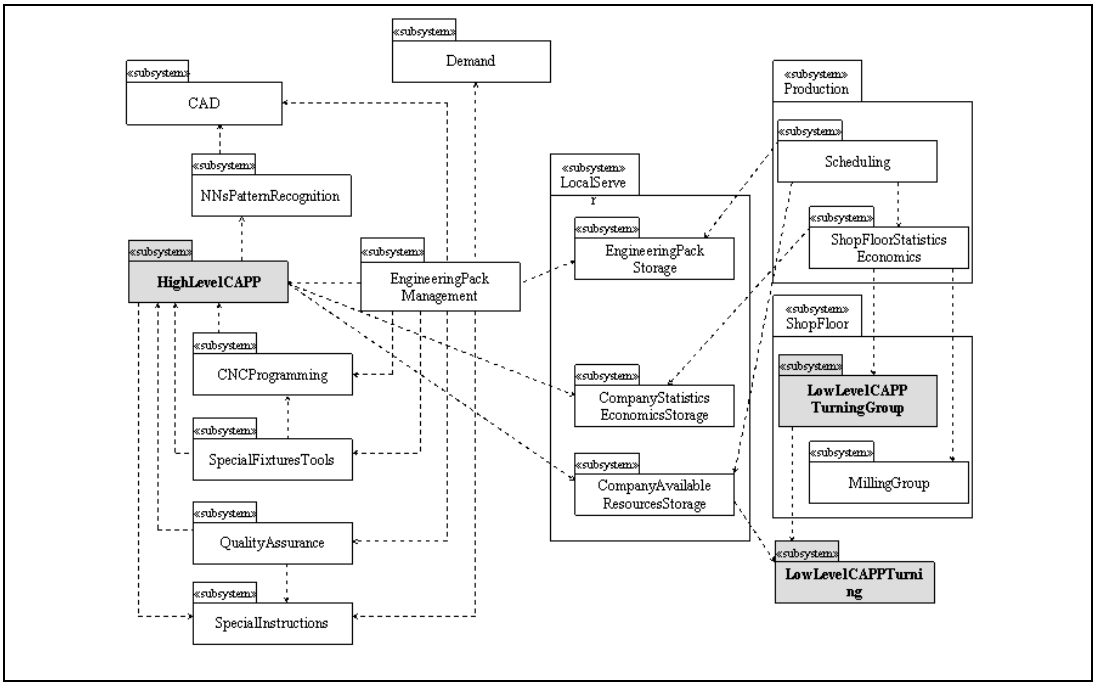

Figure G.6 SACAPP, a system of systems

G.10 SACAPP Analysis and Design Plan

The analysis and design (Table G.6) guided the candidate architecture. During this analysis, the use-case model was transformed via an analysis model into a design model that is, to a structure of classifiers and use-case realizations.

Table G.1 SACAPP requirements plan

No	Task Name	Inception	Elaboration	Construction	Transition	Comments
1	Understand and elicit stakeholders needs and requirements; develop vision; and capture a common vocabulary	Initial	Complete			
2	Analyse the problem: assess business status; identify and refine business processes; refine roles and responsibilities; and explore process automation	Complete				
3	Find actors	Initial	Complete			
4	Find use cases; Describe use-case; Manage dependencies	Initial	Update	Complete		
5	Feature list (a list of candidate requirements)	Initial	Update	Complete		
6	Manage the scope of the system; Use-case ranking list	Initial	Update	Complete		
7	Detail a use case	Initial	Update			
5.3	Prototype the user interface	Initial	Update	Complete		
6	Manage changing requirements	Initial	Update	Update	Complete	

NOTE: Find use cases / Use-case mass described: Inception 50% / 10%, Elaboration 80% / 40-80%, Construction 100% / 100% (Vliet, 2000)

Table G.2 SACAPP list candidate requirements

No	Feature Name	Status: Proposed, Approved, Incorporated, Validated	Estimated Costs/Time	Priority: Critical, Important, Ancillary, Future	Implementation Risks: Critical, Significant, Routine
1	Prototype	Incorporated	-	Critical	Critical
	Description: It demonstrates SACAPP concept				
2	Architecture	Incorporated	-	Critical	Critical
	Description: Practical for problem solving, efficient, simple, low cost, with flexible, adaptable, and portable interface.				
3	myGUI	Incorporated	-	Critical	Critical
	Description: In line with the current industrial practices, easy to use				
4	SADwO	Incorporated	-	Critical	Critical
	Description: Simplify the problem of recognising features from design, and create an easy design-CAPP communication				
5	SACAPP	Incorporated	-	Critical	Critical
	Description: Simplify process planner's effort, and improves the accuracy and productivity in process plans generation				
6	ML-CAPP	Proposed	1,5 years	Future	Routine
	Description: Machine Level CAPP: supports the operator; real time recording of machining parameters; history display function.				
7	EasyCom	Incorporated	-	Critical	Critical
	Description: Easy access to sales internal order, material data sheet, design, company resources				

8	HumanCAPP	Incorporated	-	Critical	Critical
	Description: The final process plans should have an human final touch				
9	ProdCom	Proposed	2 years	Future	Routine
	Description: Real-time communication between production and the CAPP system to reduce costs, paperwork and processing time				
10	DesEstCAPP	Proposed	1.5 years	Future	Routine
	Description: Conceptual design-estimation-CAPP integration				
11	MultimediaCAPP	Proposed	2 years	Future	Routine
	Description: Multimedia process plans with ability to merge text, graphics, video, voice and other multimedia formats				
12	Process-centric CAPP	Proposed	2 years	Future	Routine
	Description: A collaborative and interdisciplinary problem solving CAPP architecture that could be expected, over time, shift toward and expand the notion of IT infrastructure, and consequently become a mechanism for company integration.				

Table G.3 SACAPP event table

Subject (the actor)	Verb (the action)	Object (the focus of action)	Frequency (Average)	Arrival Pattern (periodic or episodic)	Relatively high level anticipated response
Board of Directors	Decides	Processes	1/year	Periodic	The SAM (South African Management) system

SAM System	Saves	Decision	1/year	Periodic	Save/edit decisions related to resources
SAM Administrator	Retrieves	Decision	1/day	Episodic	SAM administrator retrieves the decision from the database, edits it, then resaved it in the database.
Sales Administrator	Fills	Internal Works Order	12/day	Episodic	IWO is edited and saved in the SAS (South African Sales) system
SAS System	Saves	Internal Works Order	12/day	Episodic	IWO is saved in the database
Sales Administrator	Retrieves	Works Order	2/day	Episodic	The SAS system retrieves IWO from the database
Estimator	Issues	Quotation	12/day	Episodic	Please see the remarks above.
Design Engineer	Designs	Drawing	2/day	Episodic	SADwO system edits/saves the drawing
SADwO System	Saves	Drawing	2/day	Episodic	Engineering drawing is saved in the database
Design Engineer	Retrieves	Drawing	1/day	Episodic	SADwO System retrieves, edit, save the drawing
Process Planner	Sets	Process	2/year	Episodic	SACAPP system edits/saves system's settings
SACAPP System	Saves	Process Setting	2/year	Episodic	Process settings are saved in the database
Process Planner	Retrieves	Process Setting	2/year	Episodic	The SACAPP system retrieves process settings, edits them, and resaved them in the database.
Process Planner	Deals with	Process Planning	10/day	Episodic	Process Planning activity is selected in the SACAPP System main menu

SACAPP System	Shows	Process Planning frame	10/day	Episodic	SACAPP system waits for the process planner to enter sales and drawing file numbers
Process Planner	Enters	Sales/Drawing file numbers	10/day	Episodic	SACAPP system displays required specific information organised by input
SACAPP System	Output	Process Plan	10/day	Episodic	The Process Plan is edited and saved
SACAPP System	Saves	Process Plan	10/day	Episodic	The Process Plan is saved in the database
Process Planner	Retrieves	Process Plan	10/day	Episodic	The SACAPP system retrieves the process plan from the database; edit/resaves it.

Table G.4 "Use Input" use-case template

Use-Case name:	Use Input	Priority: 1
Brief description & goals:	Collects sales and design CAPP specific data	
Preconditions:	Sales and design data specific files must exist	
Trigger event(s):	Process planner enter sales and design fine numbers	
Primary actor:	Process planner	
Constraints/Risks:	See Risk List	
-	User action	System response

Primary flow of events:	User enter the sales and the design file numbers	SACAPP displays information from these files
Alternate flow of events:	Use manual process	Save the manual process plan in the database
Error flow:	Files are corrupted	Display error message
Post-conditions:	Enhance process planning quality, then save work	The file is saved in the database.
Revision control:		

Table G.5 "Set Process" use-case template

Use-Case name:	Set Process	Priority: 1
Brief description & goals:	Sets operation name, code, setting time, machine-tool, special tools required, and the operation description.	
Preconditions:	Process available within the company.	
Trigger event(s):	The process is available within the company	
Primary actor:	Process planner	
Constraints/Risks:	The process exists within the company, or the process plan will indicate "Outside cooperation"	
-	User action	System response
Primary flow of events:	Enter new plan data; or retrieve plan data, edit, save	Displays the existing process settings
Alternate flow of events:	Use manual process	Save the manual process plan in the database
Error flow:	Files are corrupted	Display error message

Post-conditions:	-	The process plan and route sheet are generated
Revision control:		

Table G.6 SACAPP analysis and design plan

No	Task Name	Inception	Elaboration	Construction	Transition	Comments
1	Initial architecture is analysed and reviewed	A first cut	Complete			
2	Use-case behaviour analysis; Model the user experience	A first cut	Update	Complete		
3	Refine the architecture: Identify design elements; Use-case design; Review the design.	A first cut	Complete			
4	Refine the architecture: Identify design mechanisms; Incorporate existing design elements; Describe the run-time architecture; Describe distribution.	A first cut	Update	Update	Complete	
4	Detail the design: Use-case design; Subsystem design; Component design; Class design; Database design.	A first cut	Update	Complete		

NOTE: Use-case mass analysed/designed: Inception 5% / Small, Elaboration 20%-40% / Less 10%, Construction 100% / 100 (Vliet, 2000)