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Radiata Theme

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Requirements Analysis for Virtual Forest Framework

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EXECUTIVE SUMMARY

To gather information on system requirements for the Virtual Forest Framework, a Use Case approach was used to document needs. In the first phase of this study, FFR members were asked to participate in an informal discussion where they would list their current and future uses of a forest planning and operations system. The second phase is to receive feedback from the wider membership, on an initial set of ideas or “strawman”.

From the initial survey of five companies, the end user requirements of the system were found to be quite similar for each respondent.
Current needs are reasonably well served by the functionality of the present tools such as ATLAS Forecaster, FFR Radiata Pine Calculator, and YTGEN.
However the future needs of users indicate a broader scope of forestry value chain modelling, with greater detail and linkages that allow genotype selection and site impacts to be better modelled, particularly in terms of wood quality. At the other end of the value chain, end product performance and future log prices are also of some interest to users.
Environmental services have reasonably high interest, particularly where near term markets are evident, e.g. carbon, or they may have more influence in the future, such as recreational use, water quality, and control of soil erosion.

BACKGROUND

Investors in the IFS research programme (FRST and Industry) seek high level outcomes and not just a series of outputs, i.e., they wish to improve the national economy or their enterprise profitability sustainably through forestry. To achieve this from the numerous projects and tasks in this large programme, integration of outputs into a practical delivery framework is necessary. The delivery framework is aimed at assisting investors in making key strategic and tactical decisions.

Research in Objective 3 of the Radiata Management Theme has begun with a survey that provided insights on decision making and expectations of tools from key decision makers in the forest growing industry (see FFR report from Task 3.1.1). It then goes on to run a pilot study of value chain modelling, while concurrently assessing from a selected user group, the likely requirements they have of the system, now and in the future. This report gives details of the requirements analysis.

INTRODUCTION

Specifying the required end uses of a system is a key step in the design process of a software tool. It has been formally recognised (Rational Software, 1988) that software requirements can be specified from “Use Cases”. Use cases are simply a record of the business requirements, steps and processes a user may desire from a new software system. Technical specifications are driven by the Use Cases, and this process ensures the tool developed at the end of the software engineering process will better meet the needs of the end user.

METHODS

For efficiency and cost reasons the requirements survey was carried out in two phases. Initial participants were large companies that provided a broad range of business needs and were easily reached. The second phase is to receive feedback from the wider membership, on an initial set of ideas or “strawman”.

Time constraints have meant that it was not possible to speak to as many people in the initial phase as desired. The authors would like to thank the participants in the initial phase, many of whom had useful insights and issues to be considered, and gave freely of their time. Many interviews lasted more than one hour.

In analysing results, numerical analysis was avoided, as the ways users describe their requirements are inevitably different with each organisation. Participants were asked to first consider their current needs, then to think of future requirements and needs.

For systems design input and overall framework technical requirements, Scion scientists and software engineers were also consulted.

RESULTS

The initial survey was carried out with five large organisations, interviewing all but two of the respondents face to face, otherwise by telephone. Information given has been kept anonymous, but is summarised in Appendix 1. The companies that contributed are listed in Appendix 2.

Current Uses

Many participants described similar Use Cases. These have been generalised into the following summary.

1. Yield Table generation
    1. Input inventory data, initialise models
    2. Set functions
    3. Define log grades
    4. Select rotation length/s
    5. Report yield table
    6. Feedback on actual yields, after harvest, for verification and calibration

2. Regime evaluation
    1. Initialise with data from pre-prune/thin check plots
    2. Set site and GF
    3. Design tending options,
    4. Select rotation length/s
    5. Report yield and transfer to economic analysis

3. Silvicultural operations scheduling
    1. Plan pre-operation assessment
    2. Initialise model with pre-op assessment data
    3 Time operations
    4 Report schedule
    5. Enter schedule into Stand Record System

4. SOP/Production Planning
    1. Rerun of yield tables with new cutting strategies as markets change

5. Land acquisition
    Uses #1 above but requires site/soil/land classification information to set productivity indices in system. Other factors influencing decisions include estimated roading and harvesting costs, lead distances to market, and environmental impacts.

Future Uses

1. Yield Table generation
    1. Use site specific info from GIS, soils, climate, terrain, etc.
    2. Genotype selection – links to Breeding Value Db or GF Plus values
    3. Species siting – links to Species Siting DSS
    4. Establishment regime and early growth enhancement – link to Establishment DSS
    5. Model environmental services – add to wood yield tables

2. Regime evaluation
    1. Model stand edge effects – yields and wind effects
    2. Include Wood Quality modelling
    3. Develop new log grades
    4. Operations Costing information
    5. Value benefits of genetic gain in growth and WQ variability

6. Deployment methods genotype
7. Site and soil characteristics
8. Weed competition – cost/benefits

Overall Framework

The framework, which will manage the total system, will have some of the following requirements:

1. Driven from both ends, i.e., Site or End product performance – forward or backwards (mainly from solid wood pathway)
2. Scalable system – complexity only when required, turn off inputs and or processing complexity
3. Optimisation and scenario management capability
4. Input from processors – imperative to gain their buy-in to system, if it is to aid log price negotiation.

System design

Suggested requirements for the general design and architecture are as follows:

1. Flexibility to deal with a range of users and uses
2. Modular – to allow programs within the system to be used in isolation
3. Robust
4. Accurate
5. Transparent
6. Future proofed, both in terms of the software used and the adaptability necessary to add new characteristics and attributes as the changing environment alters requirements
7. Ability to fast track use and also to do detailed analysis when required
8. Ability to handle large volumes of data efficiently
9. Easy to import and export from and to other systems.

Running on industry standard hardware and software.

CONCLUSION

Requirements for the current and future forest planning and operations tools were quite similar for each of the participants involved in an initial survey.

Current needs are reasonably well served by the functionality of currently available tools such as ATLAS Forecaster, FFR Radiata Pine Calculator, and YTGEN. However the future needs and uses indicate a broader scope of forestry value chain modelling capability with greater detail and linkages that allow genotype, site, and wood quality issues to be better modelled. At the start of the value chain, decision support for genotype selection, planting stock, establishment practice, and site management seem to be required. At the other end of the value chain, end product performance and future log prices have moderate interest from users. Environmental services, particularly where near term markets such as carbon are evident, have reasonably high interest but are seen as part of a yield table generation Use Case.

Other areas which currently have limited financial impact in commercial forestry (but may have more influence in the future) include water quality, recreational uses, and erosion control.

REFERENCES

West, G., Harrington, J., Pont D., Sellier D., Douglas M., Clement, B. Value chain pilot study. FFR Task 3.1.1. Draft report. June 2008.

Rational Software. “Rational University Training” Object Orientated analysis and Design. Student Manual V4.0 . Nov 1998.

APPENDICES

Appendix 1: Use Cases

Company	Role	Business process	Current Steps	Future needs
1a	Consultant	Stand valuation	1. Input inventory data, 2. Set functions,3 Define log grades, 4. Select rotation length/s, 5. Report yield table, 6. Enter yields into economic analysis	1. Use site-specific info from GIS, etc. 2. Genotype selection – links to Breeding Value Db or GF Plus 3. Species siting DSS 4. Establishment regime and early growth enhancement DSS 5. Operations Costing info 6. Scalable system
1b	Resource Forester	Harvest Plans	As above 1-5. 6. Enter yield into estate planning tool	As above plus: 1. Model stand edge effects 2. Model environmental services 3. Optimisation & scenario management
1c	Harvesting Manager	SOP	1. Request rerun of yield tables with new cutting strategies	1. Market futures framework
2a	Resource Forester	Yield Table generation	1. Input inventory data, 2. Set functions,3 Define log grades, 4. Select rotation/s length, 5. Report yield table,	1. Model environmental services
2b	Analyst	Land purchase evaluation	1. Use of land classification index, 2. Set functions, 3 define log grades, 4. Select rotation/s length, 5. Report yield table, 6. Enter yields into economic analysis	
2c	Silvicultural Forester	Regime evaluation	As 2a above. 1. Site specific information – soils, altitude	1. Carbon from young stands, 2. Genotype selection, 3. Final products performance – relate to log value , 4 Sensitivity analysis
2d	Resource Forester	Silvi scheduling	1. Plan pre-op assessment. 2. Initialise model with assessment data , 3 Time ops, 4 Report schedule, 5. Enter schedule into SRS.	
3a	Resource	Yield Table generation	1. Input inventory data, 2. Set functions,3 Define log	1. Include WQ modelling 2.

	Forester		grades, 4. Select rotation/s length, 5. Report yield table,	Develop new log grades,
3b	Resource Forester	Reconciling harvest volumes	1. Inventory-based yield tables compared with harvest volumes, 2. Adjustments to yield table tool with fudge factors	(This appears to be primarily an iteration of Yield Table generation use case)
3c	Resource Forester	Silvi scheduling	1. Schedule thinning by MTH based on general regime	
3d	Resource Forester	Regime evaluation	1. Initialise with pre-thin check age 5, 2. Set site and GF, 3. Design tending options, 4. Fix rot age, 5. Report yield and transfer to economic analysis	1. Value benefits of genetic gain in growth and WQ variability,2. Deployment methods genotype, 3.Site and soil characteristics, 4. Weed competition – cost/benefits 5. End product performance – sawn timber, 6. Feed back to log prices.
4a	Resource Forester	Yield Table generation	1. Input inventory data, 2. Initialise system,3 Define log grades and prices, 4. Select rotation/s length, 5. Report yield table,	1. Model clonal forestry, 2. Site specific management – link to GIS- land acquisitions
4b	Resource Forester	Reconciling harvest volumes	1. Inventory-based yield tables compared with harvest volumes, 2. Adjustments to yield table tool with adjustment factors	
4c	Tree crop Forester	Regime evaluation	1. Use own genotype evaluation model to select seedlots, 2. Initialise with site information, 3. Design tending options, 4. Examine weeds/nutrition issues, 5. Report yield and transfer to economic analysis	1. Model environmental services, 2. Model cost of compliance, 3. Scenario management,
4d	Harvesting Manager	SOP/Production Planning	1. request rerun of yield tables with new cutting strategies	

Appendix 2: Initial Organisations contributing

Organisation	Location	Respondent
P F Olsens Ltd	Rotorua	Jeff Schnell,
Timberlands	Rotorua	Ian Hinton
Hancocks Forest Managment		Dave Lowry
Silmetra	Tokoroa	Brian Rawley
Pan Pac Forest Products	Rotorua	Brian Garnett, Brett Gilmour
Rayonier NZ Ltd	Auckland	Jeremy Wilson