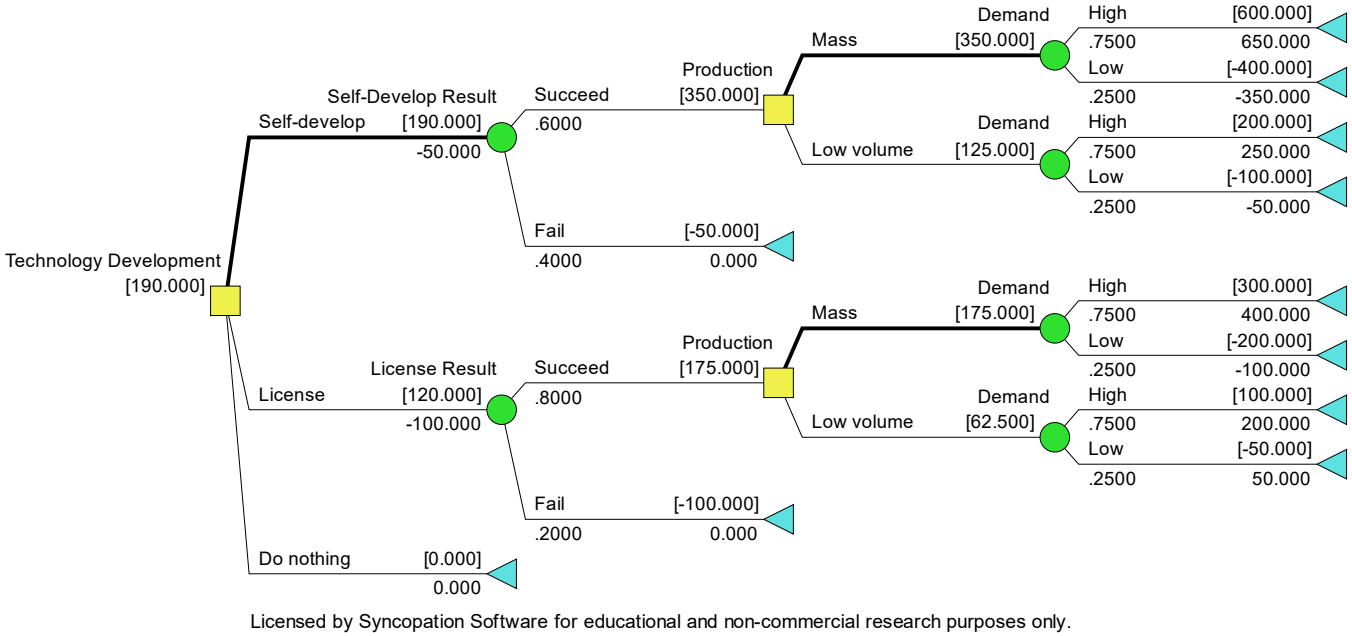
IE5203 Decision Analysis
Solutions to Assignment 1

(*a*)

- The Decision Tree:



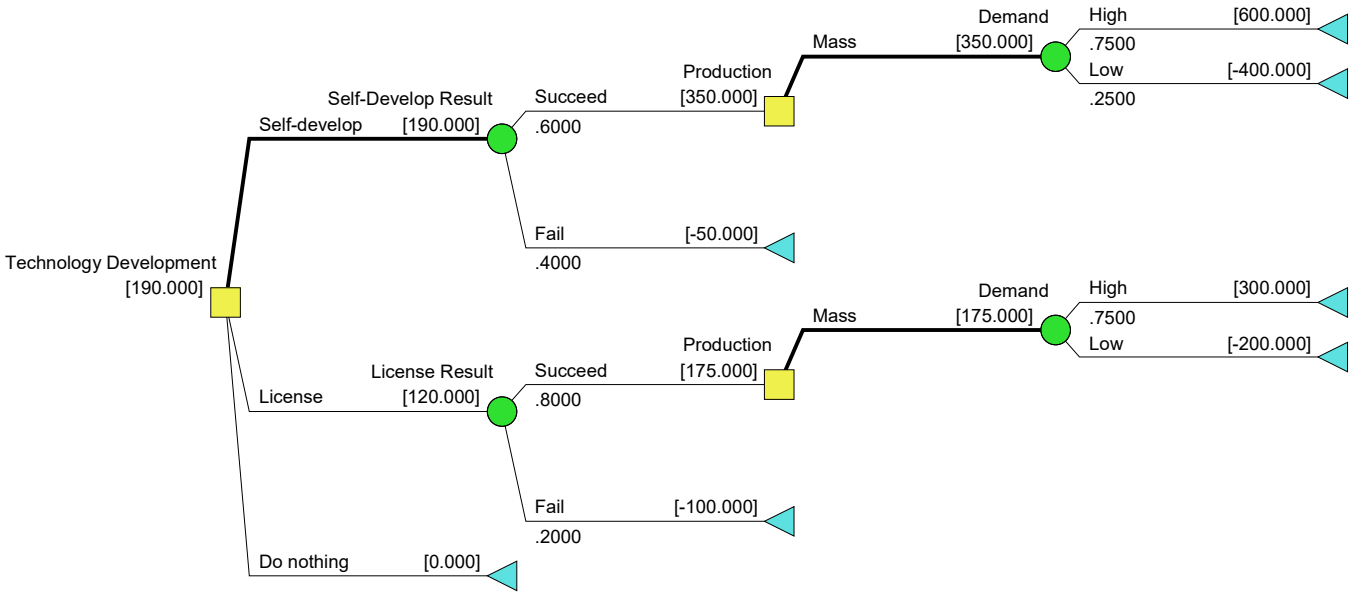
- The Optimal Decision Policy is

  Self-Develop Technology
  If Development is Successful then
  Do Mass production
  Else
  Terminate project

- Optimal Certainty Equivalent (Expected Value) = **$ <u>190,000</u>**

(*b*) Plotting Risk Profiles:

- Remove sub-optimal branches from decision policy tree:



- End-point values (sorted) and joint probabilities:

Alternative A: Self-Develop

End-point	Value $K	Probability
1	-400	0.6 x 0.25 = 0.15
2	-50	= 0.40
3	600	0.6 x 0.75 = 0.45

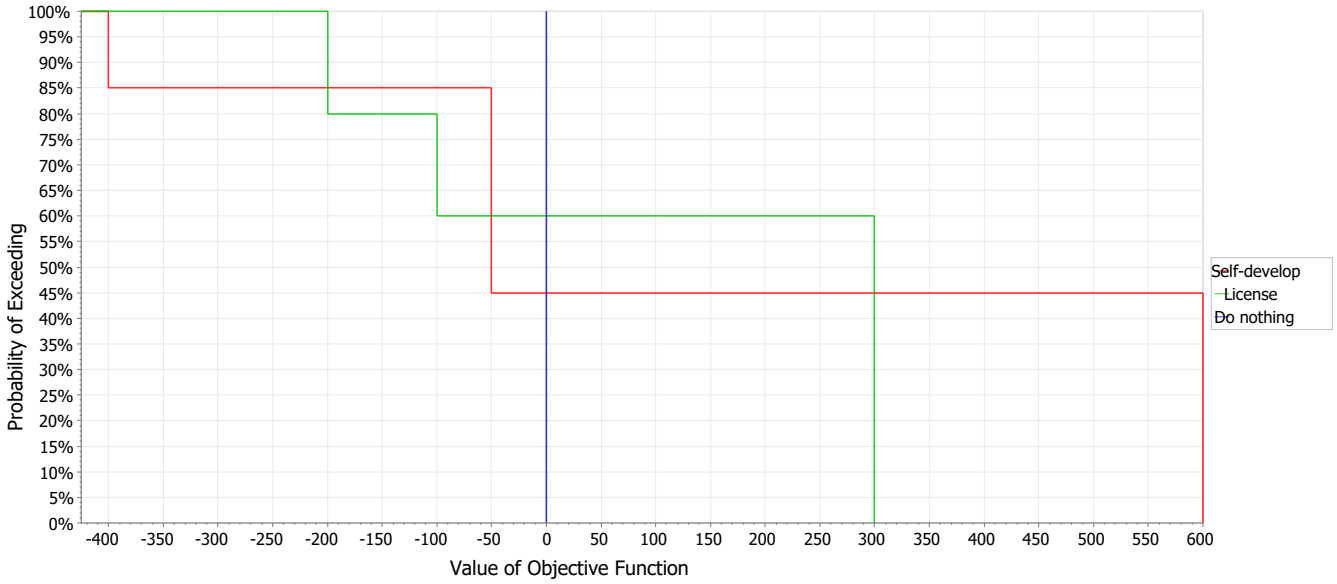
Alternative B: License and Adapt

End-point	Value $K	Probability
1	-200	0.8 x 0.25 = 0.20
2	-100	= 0.20
3	300	0.8 x 0.75 = 0.60

Alternative C: Do nothing

End-point	Value $K	Probability
1	0	1

- Risk Profiles in Excess Probabilities:

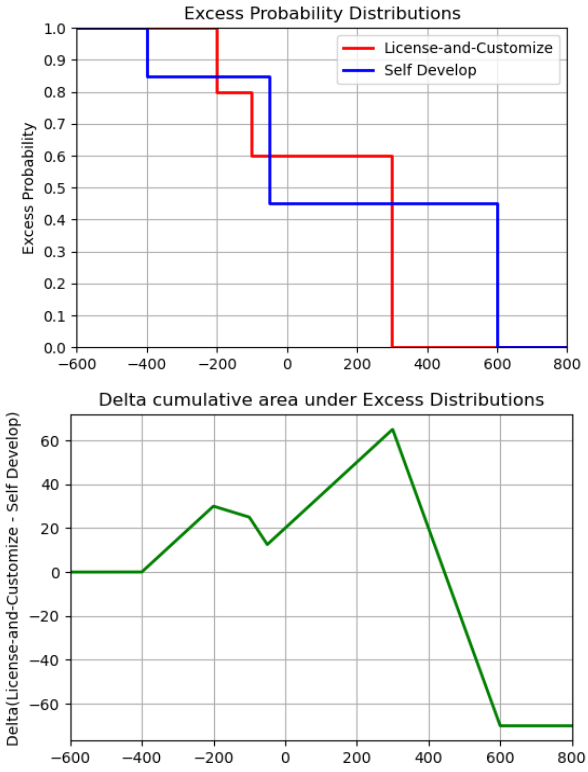


(*c*) First-order Stochastic Dominance Analysis

- There is no first-order stochastic dominance between the 3 alternatives as their risk profiles intersect each other.

(*d*) Second-order Stochastic Dominance Analysis between A and B.

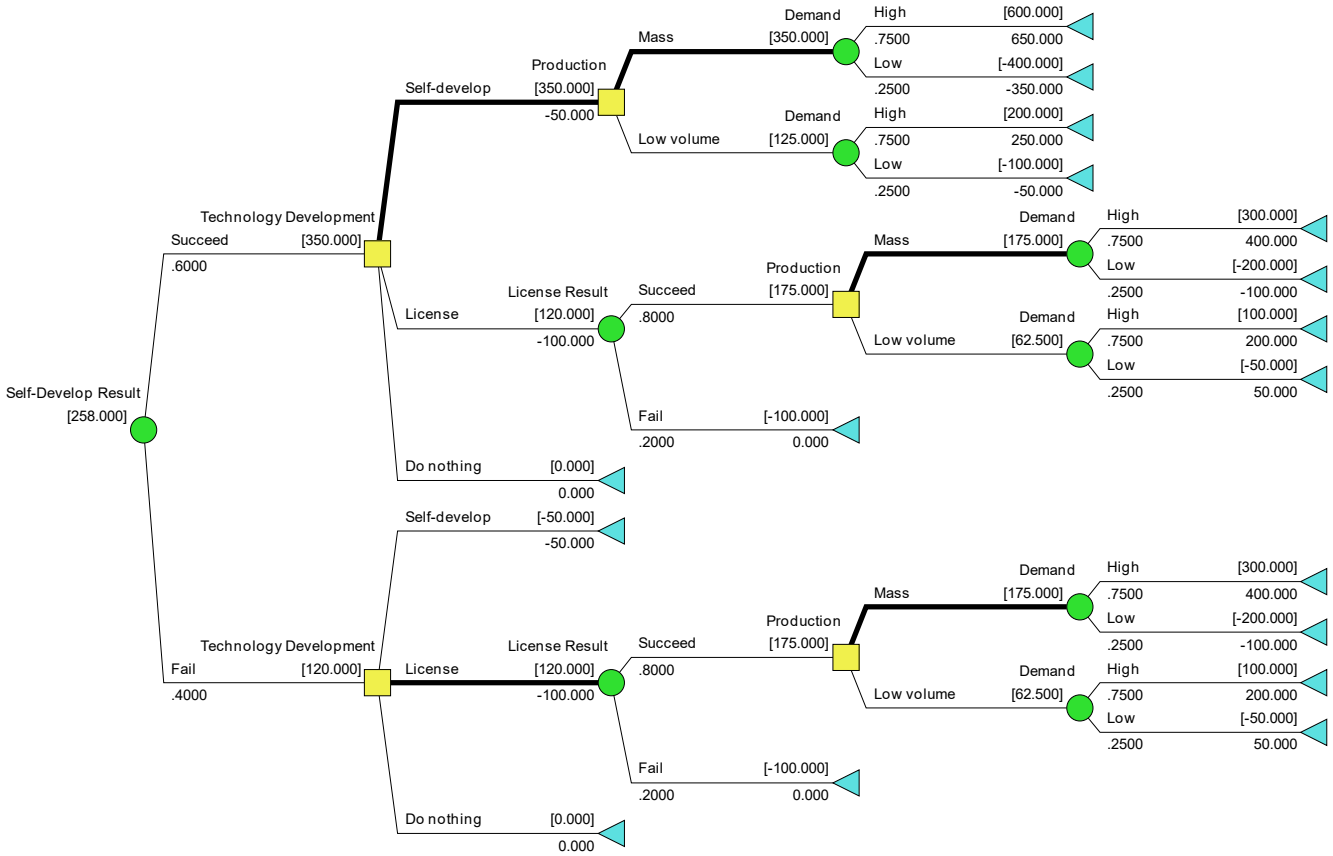
Note that B (License) might dominates A (Self-develop), but not vice versa.



- **B does not second-order dominates A** as the difference in cumulative areas under the excess distributions between B and A becomes negative after around 400+.

(*e*)

- Decision model with free perfect information on Self-Develop Technology result:



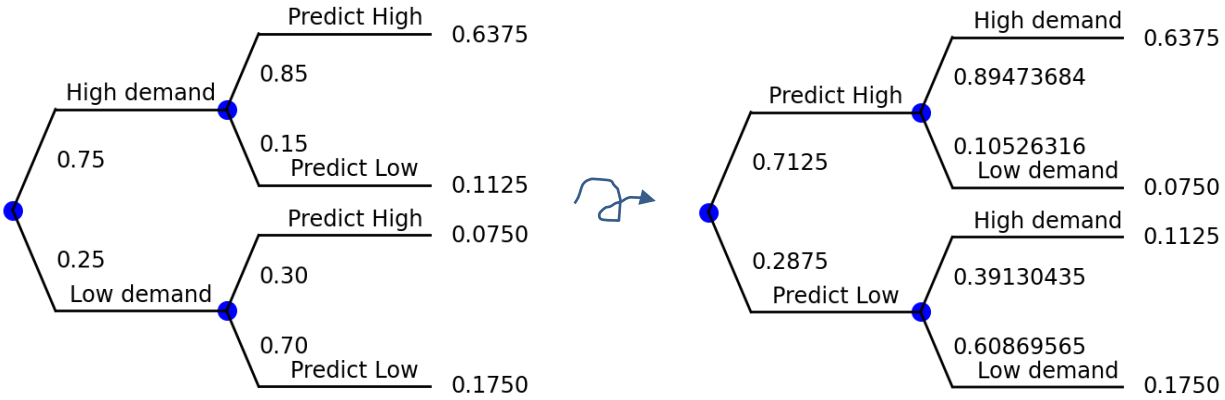
- Expected value with free perfect information on Self-Develop Technology result = $258,000
- Expected value with no information = $190,000
- Expected value of perfect information on whether self-developing the technology result

  = 258,000 – 190,000

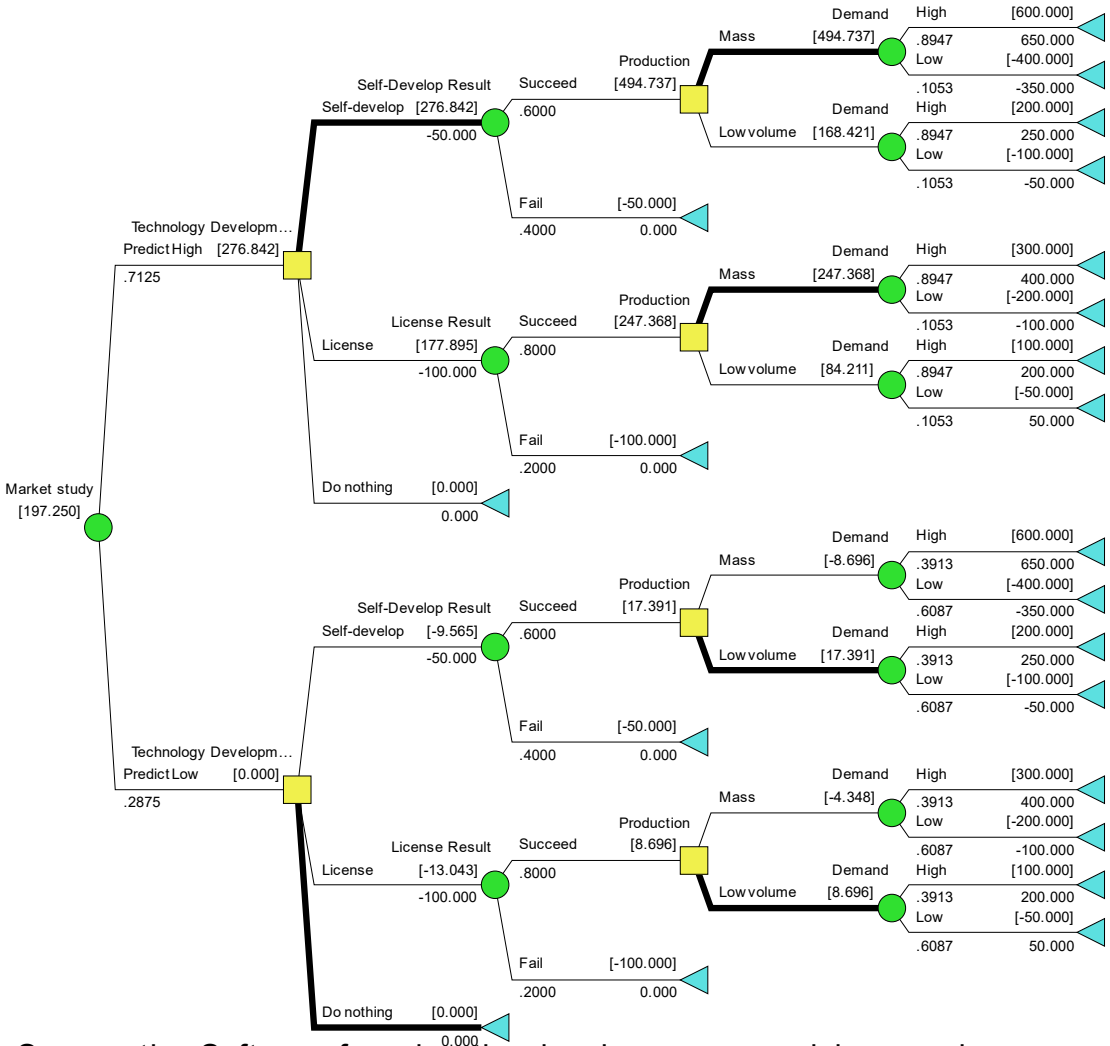
  = **$ <u>68,000</u>**

(*f*)

- Flip the market study performance tree:



- Decision model with free market study on product demand:



- Expected value with free market study = $197,250
- Expected value with no market study = $190,000
- Hence expected value of imperfect market study = $197,250 - $190,000 = **$ 7,250.**
- Hence the company should spend only up to a maximum of $7,250 for the market study.
- Optimal decision policy with free market study:

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If the market study predicts “High demand”:
        Self-develop technology
        If Successful:
                Mass produce the product
        Else:
                Terminate project
Else:
        Do nothing
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