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My love, you are an angel... Protecting your spouse with a Life Insurance Policy!

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My love, you are an angel...

**Protecting your spouse with a
Life Insurance Policy!**

**A Business Decision Management case for
INFN50**

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A case about Life Insurance Policy

One day you are engaged or married to someone and share a life, and maybe even have children. You have a home together and you perhaps have a second home or summer house. The chance is also quite big that you have borrowed much money from the bank to buy your home(s).

So, if you have a life together you probably also have shared household finances/economics. The economic burden of the household should be distributed among the two of you according to whatever “policy” you agree on: All income and expenses are treated as a single economy; A large part of the income and expenses is treated as a single economy, but you get some pocket money you may spend as you wish; The expenses are distributed according to wealth and your share of the expenses is set according to your share of the combined income and the rest is yours to spend as you wish; Some other policy or distribution model.

Notwithstanding this policy, you or your spouse may face grave economic circumstances should the significant other die prematurely. Apart from having to cope with grief and all the burdening practicalities of funeral ceremonies and such, you might find yourself in peril and dire economic problems: How will you afford your home on just one income? You could probably be without a car or summer house, but you cannot cope without a home.

In case of such a family disaster, one way to protect your spouse is to get a life insurance policy. In case you die prematurely your spouse/beneficiary/-ies will get an amount according to your insurance policy. That will not relieve him/her of the grief but may at least protect from having to give up the home because he or she cannot afford it on one income.

There are of course a plenitude of insurance companies and life insurance policies in the world, and the laws and regulations regulating this will vary according to country and company. This case is by no means a model for such insurance companies and policies and does not intend to portray a real-life insurance policy with all the rules, regulations, exceptions, decisions, actors, and work tasks associated with it.

This case is designed to be complex and challenging yet simplified enough to function in the INFN50 Master course in IS. It is based on real life insurance policy information found on the web, but still on a less detailed and fictitious level. The case is therefore maybe sometimes strange or “unreal” to make it delimited enough to be manageable on a 7.5 credit course.

We do not expect you to go beyond the case, but you are of course free to do so. The case is also not designed for a course in law or insurance policy development,

but for decision management and automation in an IS education graduate programme. Whether certain companies and their policies agree or not with the case is therefore not something that is important and the supervisors on the course will not be able to answer questions that are beyond the case text and instructions.

How to get the Life Insurance Policy

To get a life insurance policy you go to Insurance Company's web site and select the link to apply. You will then need to answer an on-line questionnaire with question about your age and other personal details:

- Personal ID
- Full name
- Address and contact information

After this, you will need to fill in a health declaration form with detailed questions about your spare time habits, your sports and exercises, known illnesses and diseases, if and what kind of medicine you are on, whether you smoke or use other nicotine products, how much alcohol you consume per week, and if you use other drugs. Mind you, this is something you solemnly swear are true facts about yourself and in case you have lied, your insurance policy might be invalidated when your spouse/beneficiaries need to use it.

Apart from this, your age, your current employment, and occupation, whether you work parttime or fulltime, and whether you work daywork, shiftwork, or nightwork are facts that are used to calculate risk scores.

You are eligible to apply for a life insurance policy from the age of twenty. You are not eligible to apply for a life insurance policy if you are more than seventy years of age. The policy will expire at the age of eighty-five.

You may choose an insurance amount between 200 000 and 7 000 000 kronor, unless you are 65 years of age or older when the maximum insurance amount is 2 000 000 kronor.

Premium calculations

Your age and chosen insurance amount are used to calculate your monthly premium. The calculation is based on the average life expectancy of eighty-three years.

The monthly premium calculation depends on two factors – Age Factor and Insurance Amount Factor – according to **Equation 1**.

$$\text{Monthly Premium} = \text{Age Factor} * \text{Insurance Amount Factor}$$

Equation 1: Monthly Premium Calculation

Insurance Amount Factor

The risk increases exponentially for insurance amount and the risk of an insurance amount of 7 000 000 is for example 2.36 times higher than for an insurance amount of 200 000. This factor is calculated as in **Equation 2**.

$$\text{Insurance Amount Factor} = 1.259 + \left(\frac{1.259 \left(\left(\frac{\text{Insurance Amount}}{1000} \right)^{0.0032} \right)}{100} \right)$$

Equation 2: Insurance Amount Factor Calculation

Applicant Age Factor

The most important risk is of course the age of the applicant. A 30-year-old presents quite another risk than a 65-year-old. On average, in a population, the risk of dying prematurely will be exponentially higher with increasing age. The economic risk connected with applicant age will also be higher for a larger insurance amount. This factor is calculated as in **Equation 3** with *Age Risk Factor* described below.

A 65-year-old applicant for an insurance amount of 2 000 000 presents a 9.156 times higher risk than for a 30-year-old applicant for the same insurance amount.

$$\text{Age Factor} = \frac{(\text{Insurance Amount} * \text{Age Risk Factor})}{1000}$$

Equation 3: Age Factor Calculation

Age Risk Factor

The *Age Risk Factor* has a starting value of 0.021 which is multiplied with a life expectancy risk factor according to row three of the **Table 9**.

The risk factor is calculated as $1.5(\text{col}_n \text{row}_2)$. For a 30-year-old is the risk factor thus calculated as $1.5^1 = 1.50$ while for a 50-year-old it is calculated as $1.5^4 = 5.06$. As can be seen, the risk factor increases exponentially with increasing age (row one).

This means that with less time left of the life expectancy, the more the risk factor increases.

The *Age Risk Factor* is then calculated according to **Equation 4** where f is the factor in Table 9 and s is single years in the highest decade of the age (e.g., age 52 $\rightarrow s = 2$). As an example, in Table 9 f is 4 for someone aged between 50 and 59 (inclusive) and s would be 4 for someone aged 54 giving the exponent 4.4 and $1.50^{4.4}$ in the equation.

$$\text{Age Risk Factor} = \text{Life Expectancy Risk Factor}^{f \cdot s} * 0.021$$

Equation 4: Age Risk Factor Calculation

For example, the age risk factor for an exactly forty-year-old applicant will be:

$$1.50^{2.0} * 0.021 = 0.047$$

It is also possible to calculate the age risk factor for exact age in full years. For instance, a 31-year-old would yield this (a 30-year-old will have 0.032):

$$1.50^{1.1} * 0.021 = 0.033$$

The total monthly premium pay calculation will thus be done according to **Equation 1**.

Monthly Premium Example

The monthly premium to pay for an insurance policy with an insurance amount of 2 000 000 for a 60-year-old person would thus be calculated as (Figure 1):

$$\begin{aligned}
 \text{Insurance Amount Factor} &= 1.259 + \left(\frac{1.259 \left(\left(\frac{2\,000\,000}{1000} \right)^{0.0032} \right)}{100} \right) = 1.303 \\
 \\
 \text{Age Risk Factor} &= 1.50^{6.0} * 0.021 = 0.239 \\
 \\
 \text{Age Factor} &= \frac{2\,000\,000 * 0.239}{1000} = 478 \\
 \\
 \text{Monthly Premium} &= 478 * 1.303 = 623 \text{ SEK}
 \end{aligned}$$

Figure 1: Monthly premium calculation example 1

Health declaration

A particularly important part of applying for a life insurance policy with Insurance Company is the health declaration protocol. This has a significant impact on whether Insurance Company deems you as eligible for a policy or not.

In the health declaration on-line form, you fill in several details about your personal conditions, and work and spare-time circumstances. These details are compared to the eligibility scoring tables below and a scoring sum is calculated. In addition, there is an age factor table with constants that is used to cater for the increased risk of aging. Your eligibility scoring is multiplied with your age factor to give your total score, which must not exceed 20.0.

Eligibility scoring tables

Table 1: Occupation risk scores

Occupation	Score
Lorry driver	2
Construction worker	2
Farmer or forester	2
Machine repairperson	1
Firefighter	3
Police officer	3
Military	2

Professional diver	5
Other	0

Table 2: Organisation of work risk scores

Working time	Organisation of working time	Score
Fulltime	Daywork	0
	Shiftwork	2
	Nightwork	4
Parttime	Daywork	0
	Shiftwork	1
	Nightwork	2

Table 3: Sport activities risk scores

Sports	Score
Aviation sports	5
Full-contact martial arts	2
Equestrian sports	3
Motorsports	3
Extreme skiing	5
Sport climbing and mountaineering	4
Freediving with apnoea	5
Shooting	1
Curling and other ice sports except ice hockey	0
Billiards	0
Aquatics except free diving	1
Ball sports incl. ice hockey	0
Track and field	0
Other	0

Table 4: Physical activity risk scores

Physical activity - Minutes per week	Score
> 799	3
650-799	2
500-649	1
300-499	0
150-299	1
50-149	2
0-49	3

Table 5: Drug use risk scores

Alcohol and other drugs	Score
Alcohol more than 2 cl 100% per day	3
Narcotics	4
Smoking	3
No risk consumption	0

Table 6: Known diseases risk scores

Known diseases	Score
Allergies	1
Cancer diseases	5
Cardiovascular diseases	5
Diabetes type 1	2
Diabetes type 2	3
No diseases	0

Table 7: Body Mass Index risk scores

BMI	Score
< 18.5	1
18.5 – 24.9	0
25.0 – 29.9	1
30.0 – 34.9	2
35.0 – 39.9	4
> = 40	6

Table 8: Marital status risk scores

Marital status	Score
Marital status: Married/Co-habitant (Sambo)/ Live-apart together relationship (Särbo)	0
Divorced	2
Widow/widower	2
Single	2

Table 9: Life Expectancy Risk factor constants

20 Y	30 Y	40 Y	50 Y	60 Y	70 Y
0	1	2	4	6	8

Eligibility age factor

Table 10 enumerates the age risk factors for age intervals in eligibility evaluation.

Table 10: Eligibility age factor

Age in years	Factor
20-29	1.0
30-39	1.2
40-49	1.5
50-59	1.9
60-69	2.4
70	3.0

Eligibility scoring examples

The first table (Table 11) shows an automatically rejected application. The applicant has a risk occupation and quite risky sporting activities, especially considering the applicant's age interval. Apart from these factors is the applicant an insignificant risk.

Table 11: Eligibility calculation example one

Facts	Score
Occupation: Firefighter	3
Fulltime-Shiftwork	2
Sports: Aviation sports	5
Sports: Sport climbing and mountaineering	4
> 300 minutes/week physical activity	0
Alcohol and drugs: No risk consumption	0
Health status: No diseases	0
BMI: 18.5 – 24.9	0
Marital status: Single	3
Age interval: 40-49	1.5
Total (17 * 1.5)	25.5

The second table (Table 12) shows an application being routed to manual processing. In this case the applicant is divorced, in the upper middle age, and a bit too fond of alcohol. Apart from this is the applicant a moderate risk.

Table 12: Eligibility calculation example two

Facts	Score
Occupation: Other	0
Fulltime-Daywork	0
Sports: Aquatics except free diving	1
w150-300 minutes/week physical activity	1
Alcohol more than 2 cl 100% per day	3

Health status: No diseases	0
BMI: 30.0 – 34.9	2
Marital status: Divorced	2
Age interval: 50-59	1.9
Total (8 * 1.9)	15.2

The final table (Table 13) shows an applicant of insignificant risk. This applicant is approved automatically.

Table 13: Eligibility calculation example three

Facts	Score
Occupation: Other	0
Fulltime-Daywork	0
Sports: Other	0
> 300 minutes/week physical activity	0
Alcohol and drugs: No risk consumption	0
Health status: No diseases	0
25.0 – 29.9	1
Marital status: Co-habitant (Sambo)	0
Age interval: 30-39	1.2
Total (1 * 1.2)	1.2

Insurance policy decision

The eligibility scores are summed and multiplied by the age factor to give an eligibility total score. If this total score is above 20.0 the insurance application is automatically rejected because the applicant presents a risk profile that is not acceptable to Insurance Company.

If the eligibility total score is between 15.0 and 20.0 the application is referred to manual processing to further analyse the presented risk. This will mean that the applicant must agree to a deeper investigation and making his or her patient records available for scrutiny by a medical consultant appointed by Insurance Company.

An eligibility total score below 15.0 will be automatically accepted and no further processing of risk and eligibility scores is needed.

Whatever is the outcome will the applicant be informed of the decision and the explanation for this, and the sub-decisions involved in the final decision.

Changing the policy amount

You may change the amount of the policy at any time, but the following must apply:

1. The change is at least 100 000 up or down.
2. To increase the amount more than 500 000 requires a new health declaration.
 - a. The declaration will be checked using the already described eligibility criteria.
 - b. If you have had the policy for at least 10 years, the following apply:
 - i. If the eligibility score is below 18 the change of amount is accepted.
 - ii. If the eligibility score is between 18 and 22 the change of amount is referred to manual processing.
 - iii. If the eligibility score is at least 22 the change of amount is rejected.
 - c. Otherwise, the same eligibility score criteria as for a new application is used.
3. You are maximum seventy years of age.

If the change of insurance amount is accepted a new monthly premium will be calculated. This calculation considers the number of years you have had the insurance policy to calculate a new *Age Risk Factor* and *Age Factor* (Equation 5). In the equation is $f.s$ the same as in Equation 4 while y is the number of years the applicant has had the life insurance policy.

$$\text{Age Risk Factor} = \text{Life Expectancy Risk Factor}^{f.s} * 0.025^{1 + \frac{y}{100}}$$

Equation 5: Age Risk Factor Calculation for changed insurance amount

For example, *Age Risk Factor* for someone who is forty years old and has had the policy for twenty years will thus be:

$$1.50^{2.0} * 0.025^{1.10} = 0.039$$

The monthly premium is then calculated as in Figure 1 using the new *Age Risk Factor* and *Age Factor*. For example, in Figure 2 a forty-year-old person who has had the policy for twenty years applies to increase the insurance amount from 1 500 000 to 2 000 000.

That person will pay a monthly premium of one hundred and two kronor. Had that person instead applied for a new policy at the age of forty and insurance amount of 2 000 000, the monthly premium to pay according to previous calculations

would be one hundred and twenty-three kronor. Hence, he or she receives a twenty-one kronor monthly loyalty discount.

$$\begin{aligned} \text{Insurance Amount Factor} &= 1.259 + \left(\frac{1.259 \left(\left(\frac{2\,000\,000}{1000} \right)^{0.0032} \right)}{100} \right) = 1.303 \\ \\ \text{Age Risk Factor} &= 1.50^{2.0} * 0.025^{1 + \frac{\left(\frac{20}{2} \right)}{100}} = 0.039 \\ \\ \text{Age Factor} &= \frac{2\,000\,000 * 0.039}{1000} = 78 \\ \\ \text{Monthly Premium} &= 85 * 1.303 = 102 \text{ SEK} \end{aligned}$$

Figure 2: Monthly premium calculation example 2

Notification of claim

When the policy holder dies, the beneficiary/ies must contact Insurance Company no later than a year after the registered death date. Of course, there must be a valid life insurance policy with Insurance Company for any processing to commence.

Insurance Company will need permission to review the death certificate and post-mortem protocol to verify whether the cause/s of death is/are consistent with the insurance policy. Circumstances that have impact on the policy's validity and eligibility might have changed during the policy period and Insurance Company should have been made aware of them.

Accepting or rejecting the claim

Depending on circumstances the policy might be nullified altogether (the policy would e.g., not cover a person turned gangster and killed in a shoot-out) or the insurance amount might be decreased. The beneficiary/-ies is/are entitled to a swift response and explanation.

If there are no circumstances casting doubt on validity and/or eligibility, the tax-free insurance amount will be paid as an equally distributed lump sum to the account/s of the beneficiary/-ies within one month from the date of the claim of the benefit.

Your assignment

Assignment description

1. Design the *process logic* in BPMN 2.0 and identify *decision points/BR activities* in the process flow enacting decision logic to thus connect process and decision logic.
2. Design the *decision requirements* as decision model/s based on the OMG DMN standard.
3. Design and implement the *decision logic* used in the decision model/s as Boxed Expressions (Decision Tables and FEEL expressions) using Trisotech Enterprise Suite.
4. Run and test your decision solution inside Trisotech Enterprise Suite.
5. Write a reflective and scientific report about the project.

These items do not necessarily reflect a proposed working order or sequence.

The solution

There is no need to build an application since the rules and decisions can be tested inside Trisotech Enterprise Suite.

The reflective project report

The reflective project report you will hand in when you hand in the rest of the case.

The report must be grounded in the course literature and possibly other scientific literature. It will focus on your own learning from the project, viewed from a knowledge and BDM perspective. You also need to discuss your design decisions.

To support your discussions and argumentation you will use diary as an empirical research method. The diary must be detailed and elaborated enough for you to base your discussions on empirical evidence. The diary is not like the ones you might have written during childhood. It is up to you to find a suitable structure for the entries in the diary, but the following might serve as a starting point:

1. Project group and date.

2. Status of the project.
3. On what we are currently working.
4. Problems we have encountered and the reasons for these.
5. How we solved the problems and the reasoning behind the solution.
6. What we have learned.

The diary will be appended to the project report.

The project report must be written in a scientific voice, use proper referencing and language, and be argumentative.

Important Schedule Items

H1 – First checkpoint for the project. The teachers will allot time to project groups for guidance and assistance. If you have not done any work or do not have *any* questions, there is really no point for you to attend a supervision.

H2 – Second checkpoint for the project. Otherwise, same as H1.

H3 – Third checkpoint for the project. Otherwise, same as H1.

Lab 4 and 5 – Lab help with Trisotech Enterprise Suite for the case

H4 – Fourth checkpoint for the project. Otherwise, same as H1.

Lab 6 – Lab help with Trisotech Enterprise Suite for the case

Hand-in – hand-in of project documentation and reflective report.

H5 – Presentation of case solution.