1. Introduction

Information systems (IS) projects involve a high-level of risk. Risk is pervasive throughout the entire duration of a project. Many experts therefore suggest that the management of risk is central to how IS projects should be approached. One of the most recognised risk-management frameworks is the Spiral model.

In this topic, we will look at how the Spiral model is used to mitigate risks in IS projects.

Objectives: The Spiral Model

Upon completion of this topic, you should be able to

- describe how IS projects are conducted using a Spiral model
- apply the Spiral model to manage risk on a project

2. The Spiral Model

The Spiral model (Boehm, 1988) uses iterative prototypes. View the animation for an illustration.

The Spiral model

Each spiral has four main phases. Each cycle of the spiral begins with the identification of objectives, alternative means of implementing the particular stage of the product and consideration of constraints. This is followed by the evaluation of alternatives as a means of identifying and resolving risk. A prototype is usually built and the customer and development team verify the product. The next phase involves planning for the next cycle given the experience gained from the previous phase. At any point in the spiral, the customer can abort the entire project if the risk is deemed too great.
The steps in the spiral model can be generalised as follows: GM: Changed bullets to numbered list.
1. System requirements are gathered from interviews and discussions with the project stakeholders. A preliminary design is created for the new system
2. A first prototype of the new system is constructed from the preliminary design. This is a scaled-down system of the final product
3. This prototype serves as a model to verify the developer's understanding of the operation of the system
4. A plan of the requirements and life cycle of the project is then developed

A second prototype is evolved through a risk evaluation of the first prototype. The second prototype serves to validate the requirements of the users. There may be several iterations or spirals before requirements have been thoroughly validated. Once the requirements have been validated, a development plan for the development of the system is created as the plan for the next phase.

A third prototype is evolved through a risk evaluation of the second prototype. The third prototype serves to validate the design of the system. Again, this might be an iterative process. Once the design has been validated, an integration and test plan is created. A final prototype is evolved through a risk evaluation of the third prototype.

The final prototype represents the actual creation of the final system, having gone through several iterations and reached a point where the customer is satisfied that the refined prototype represents the final product desired. The final system is thoroughly evaluated and tested.

**Mitigating project risks**

Let us look at how the Spiral model can be used to mitigate various risks in IS projects.

Click each tab to learn more about how the Spiral model helps to mitigate IS project risks.

**Using the Spiral Model to mitigate project risks**

**Understanding requirements**

If there is a risk that the software may not do what it was intended to do, users can be surveyed to understand requirements better. Prototyping can reveal more about what the software does or does not do. Through increased involvement of users, the risk of interface components not performing adequately can also be alleviated.

**System features**

If users ask for too many features, prototyping can again reveal the capabilities of the software. Less expensive options may perform more than adequately, but users may require demonstration so that they can understand this. A cost-benefit analysis is useful in showing users what more advanced features would cost, and what they were expected to save. If strict budget limits exist, designing to budget would
provide the best system within a specified budget limit. If many requirement changes are experienced, changes may be postponed until the last minute with the possibility that the last proposed changes would be superseded.

**External components**

The risk of external system components failing to perform as specified can be reduced by closely monitoring performance during development. Benchmarking and inspection help to identify problems early, when corrections will cost less. Use of award-fee contracts provides added incentive for vendors to provide superior products.

**Technical performance**

Technical performance of the system is often a risk. Modelling can identify expected performance before building systems and prototyping provides a means of empirically assessing a system.

Many risks exist in IS projects. The management of these risks is critical to the successful delivery of needed IS support. The Spiral model emphasises risk analysis to yield more consistent system performance.

**Reading: The Spiral Method**


### 3. Exercise

Click the link below for an exercise to analyse how to implement the Spiral model in a project.

**Exercise: The Spiral Model**

**Exercise Alternate Text**

**Exercise**

Q1. The project team at Mountain Systems Inc has been into the project for 6 months. However, the project does not seem to be making much progress. The management team has decided that you should take over the project as project manager. You decide that the lack of risk management has been the cause of the project's problems so far and decide to use a Spiral approach to project management. Identify the most appropriate practices that you need to implement.

1. Have four cycles to ensure that the prototypes accurately reflect the final system
2. Use the evaluation of the prototype from the previous cycle to influence prototype development in the next cycle
3. Conduct a risk analysis at the beginning of each cycle
4. Allow the customer to exit the project if the risk is deemed too great
5. Avoid in-house development teams in favour of highly-trusted external
vendors to minimise risk

The correct answers are as follows:

- option 2, Use the evaluation of the prototype from the previous cycle to influence prototype development in the next cycle
- option 3, Conduct a risk analysis at the beginning of each cycle
- option 4, Allow the customer to exit the project if the risk is deemed too great

4. Self-Assessment

Now, try the self-assessment questions to test your understanding of the topic. Click the following link to open the Self-Assessment in a new window.

Self-Assessment

Q1. Which one of the following best characterises prototyping?
   1. It is a key element of the Spiral model
   2. It is only found in the Spiral model
   3. It is the most efficient way to develop a software project when required system features are well understood
   4. It should only be applied to the complete software project system

Q2. Which one of the following defines the Spiral method?
   1. It is efficient because only one pass through the project phases is required
   2. It is an alternative to prototyping as a way of dealing with IS project risk
   3. It includes iterative risk analysis and prototype development, slowing down the development process
   4. It involves multiple iterations of prototypes based on a single risk analysis

5. Summary

This topic covered the following main points:

- The Spiral model uses iterative prototyping as a means of managing project risk.
- A risk analysis is performed at the start of each cycle to identify risks and alternative options.
- Each successive prototype builds upon what was learnt in the previous prototype.
- The final prototype represents an accurate approximation of the final system.

Reference