A process analysis of customer value in agile projects

Henrik Svenbrant
Dept. of Industrial Management & Logistics,
Faculty of Engineering,
Lund University
e-mail: henrik@svenbrant.se

Abstract

Agile methods have the recent years gained ground within the software industry, but many companies mostly use Scrum as an internal management tool – not involving the customers. This research analyzes how to get customers more involved in the agile process and for which types of customers a deeper engagement increases value. It also presents the underlying factors in the development process that gain customer and business value.

The research was approached qualitatively by a multiple case study, where semi-structured interviews were the main sources of information for benchmarking three agile projects. Two analysis models were evolved from the literature; the *Scrum Customer-classification System* (SCS) and the *Critical Success Factors* (CSFs). By these models the cases were analyzed in matter of customer participation and customer value in the agile process.

The research shows that customer value is created by the *drivers* in the CSFs, and that classification levels in the SCS can describe how to get customers more involved. Though, a customer must experience that the total benefits with a deeper engagement are greater than the total sacrifices – only then is customer value created.

1. Introduction

This study was performed in cooperation with the developer of mobile applications Tactel AB during fall 2008. The company had adopted agile methods in a number of projects, and wanted to analyze how and in which cases to lift Scrum from an internal management tool to a level where the customers are more involved, aiming to improve the perceived customer value – and as a consequence the business value. Tactel also desired that the study should focus on Scrum and the in-house development project Mobical.

The problem was defined in a main research question and four propositions as follows:

> *How and where can Scrum be lifted from an internal management tool to get the customers more involved, and where is customer value created?*

In the first part of the question *how* means which factors that should be considered and *where* means for which types of customers and projects.

> *Which drivers of customer value can be identified in agile practices?*

> *How can customers be classified in matter of participation in an agile project?*

> *How well are the drivers and customer types considered by companies in Tactel's business context?*

> *How can Mobical benefit from the findings?*

The focus of the study is on Scrum in particular, but it also refers to agile methods in general.

The sources of information – mainly books and journal articles – referred to in this research

were found by searches in the following databases and web portals:

- ELIN – university data base
- http://www.scirus.com
- http://apm.org.uk
- http://www.pmi.org

In the search the following keywords were used:

- agile
- agile + customer
- agile + customer + value
- customer + value

2. Method

The exploratory part of this study – to identify underlying principles creating customer value and forming the analysis models – was approached by a literature study. As a second step a multiple case study was performed both to prove the applicability of the models and to benchmark Mobical with two other cases. The research was approached qualitatively, making it possible to adapt and evolve the models as each case was studied. To create sustainable conditions for performing the case study with high quality measures, it was constructed on the research design described by Yin [1].

2.1 Case study

The cases to study were selected to reinforce the SCS and CSF models, by predicting similar applicability and iteratively adapting and verifying them as shown in Figure 1, and to serve as relevant references for Mobical in the benchmark. A set of criteria for the cases to meet was defined and potential cases were identified by agile professionals within Tactel AB and by their colleagues. The two cases that best met the criteria was approached and agreed to the study. The three cases were individually analyzed by the final – reinforced – models, and the results were benchmarked.

In the case study data was collected by flexible semi-structured interviews, as described in the interview guide in Table A:1 in Appendix. In each case two to four project members with different responsibilities within the agile process

were interviewed, and direct observations served in a less formal way as additional sources of information.

Finally, the collected and analyzed data was used to answer the four propositions and the research question.
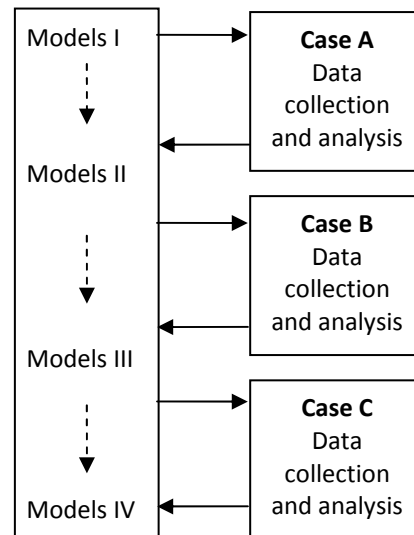

Figure 1 Evaluating and adapting the models

3. Result

3.1 Customer classification

Based on how Schwaber [2] describes the customer role, two ways for a customer to be part of the Scrum process were identified; direct or indirect. Their degree of involvement was also classified as high or low, which led to the forming of a model describing the customers' involvement. This model is referred to as the *Scrum Customer-classification System* (SCS), and shown in Figure 2.

In SCS customers are allocated to any of the four quadrants to visualize their involvement in the Scrum process. Actual customers will not necessarily be perfectly aligned with any of the four groups, and a customer's degree of involvement can for example be moderate instead of high or low.

The visualization of a customer's position can be used when considering strategies for evolving business relationships. For example, if a customer

is identified to be a Partial Participant, business relations can be strengthened by transferring the customer against the Full Participant group. The hierarchy of the levels in SCS and the normal way to progress through the matrix are also shown in the figure.
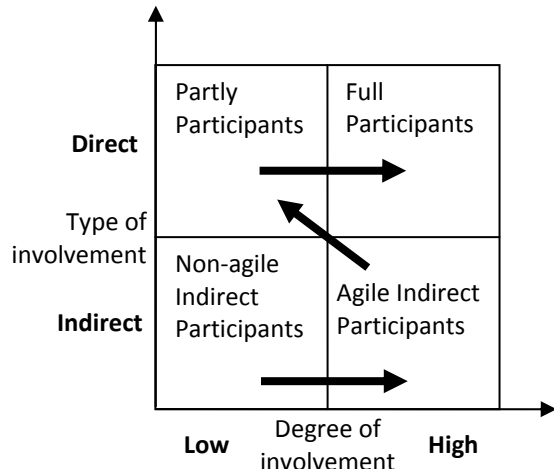

Figure 2 Scrum Customer-classification System

The direct participant customers drive the development by owning and prioritizing the Product Backlog, and they are allowed to attend demonstrations and meetings within the Scrum process. The direct approach is applicable when a project is driven by a single customer or by a single major customer for which all other minor ones are well known. The result is that the direct participant customer is sorely involved in the project.

Full Participants are customers entirely acting as project members. They are collocated with the teams, and the transparence of the vendor organization is very high for the customer. The customer is required to have refined Scrum experience and a good knowledge of the product to develop to cope with this role.

Partial Participants do perhaps not possess a complete understanding of Scrum, and the vendor organization may not be totally transparent. The customers act as product owners – prioritizing the Product Backlog – but an assistant product owner or customer project manager at the vendor company is responsible for the communication with the team and internal stakeholders.

When working with indirect participant customers the agile methodology mostly is used as an internal tool, and the customers do not posses any of the three Scrum roles. Instead the Product Owner is an employee at the vendor company representing one or multiple customers, and prioritizing all their requirements. The transparency is lower for the indirect participant customers, making it possible for the vendor to prioritize different customers in non-equal ways, with purpose to gain business advantages.

Agile Indirect Participants are aware that their projects are developed with agile methodologies, how long the sprints are, and how the frequent prioritizations and incremental deliveries work. The customers are involved in regular meetings to re-prioritize the Product Backlog, may sometimes attend the demos, and in some cases even the Scrum meetings. In multiple-customer projects, the customers often are aware of their role as one of several customers.

Non-agile Indirect Participants do not need to be aware that their product is developed with an agile methodology. They are either buying an existing product or are specifying the requirements at start of the project in a traditional way. The customers may be aware that functionality is developed in increments, but do not participate in regular reviews of the Product Backlog. Existing products may also be customized to suit each customer's specific needs. In those cases the Product Owner at the vendor company is responsible both for providing value in the base-line product and for prioritizing the different customer's adaptations.

3.2 Critical Success Factors

Chow and Cao [3] identify in their quantitative study of success factors in agile projects three significant and three auxiliary Critical Success Factors (CSFs). They define CSFs as factors that must be present for an agile project to be successful, and they measure success by four dimensions; quality, scope, time and cost.

These dimensions were in this research identified to correspond to the definition of customer value from Lean Thinking; the right product (quality and scope) for the right price

(cost) at the right time. This means that the CSFs studied by Chow and Cao relates to success in matter of customer value.

As long as an agile project implements the three significant CSFs, Chow and Cao mean that the project could be likely to be successful; i.e. could be likely to generate customer value. Implementing the auxiliary three may bring further value to the project. The CSFs are presented in Table 1 in decreasing order, where the first is the most significant one.

Table 1 The CSFs

1	Delivery Strategy
2	Agile Software Engineering Techniques
3	Team Capability
4	Project management process
5	Team environment
6	Customer involvement

Chow and Cao define the CSFs by their attributes – underlying practices, methods and environmental factors. The attributes were in this research clarified, reinforced and expanded with findings from other sources, to form an analysis model of the implementation of the CSFs in an agile project. The sources considered in the reinforcement are Berteig [4], Schwaber [2], Dybå & Dingsøyr [5], Elssamadisy [6], Livermore [7], Korkala, Abrahamsson & Kyllönen [8], Mann & Maurer [9], and Eckfeldt, Madden & Horowitz [10].

Success for a project in matter of customer value is so determined by the implementation of the CSFs, which are defined by their attributes. In this study the reinforced attributes therefore were categorized as *drivers* of customer value. A driver in this case is a measurable method or practice when implemented gains customer value, either direct or indirect. The final set of drivers is presented in Table A:2 in Appendix.

For the drivers and CSFs to be comparable, an indicative scale measuring the drivers relatively to each other was set up. The percentage scale, described in Table 2, serves as a guide when measuring the drivers. The guide is not a 5-level Likert scale where the five levels are the only permissible choices; any value from 0 to 100 is allowed.

Table 2 Indicative scale to measure drivers

100	Full implementation
75	Good implementation
50	Neither poor nor good implementation
25	Poor implementation
0	No implementation

The collecting of data for measuring of the drivers can be performed by various methods as interviews, surveys and observations. By calculating a mean value of the drivers in each of the six CSF categories, the CSFs are measured, and can be visualized and compared, as shown in Figure 4.

The CSFs and drivers described above define the Product Owner as the customer of a project, not considering whether it is the end customer or not. For different customer types are therefore more or fewer of the drivers not valid in direct relation to the end customer, and should instead relate to the Product Owner. A mapping of the drivers validity for each customer type is presented in Table A:2 in Appendix.

3.3 The cases and their customers

The first case – Mobical – develops a synchronization and backup service, and the major customers are network operators and service providers worldwide, offering the service to their subscribers. The team developing Mobical consists of a Program Manager, a Product Owner, a Customer Project Manager, and ten developers and testers, of which two also are Scrum Masters. Mobical is organized in two Scrum teams with focus on different parts of the system, and with about five engineers in each. The project has implemented Scrum for eighteen months.

Mobical has a very similar relation to all of its customers, classifying them as of the same type. The customers cannot be said to be direct participant according to the SCS since they are not holding the role of the Product Owner or allowed to attend any meetings within the agile process. They are clearly indirect participant, and the

transparency for a customer is minimal, placing the customers in the lowest part of the SCS matrix. Mobical's products are bought with customer-specific adaptations, refining a standardized product, and the in-house Product Owner is responsible for providing market value in the product and prioritizing adaptations to specific customers. This makes the customers Non-agile Indirect Participants according to the SCS. Though, there are almost always a dialogue between the Customer Project Manager and the customer, and changes in the requirements are made during the projects. Deliveries are also tried to be aligned with the sprints, placing the customers somewhat to the right in the Non-agile-Indirect-Participants box, as shown in Figure 3.

It might be possible for Mobical to align customers more with the Scrum process, especially when adding features to a system at an existing customer. This means that a transition against the Agile-Indirect-Participants box could be beneficial for mature customers, which is also indicated in the figure.

The second studied case – Audio Control – is also a project at Tactel AB, which develops and maintains a software module in Sony Ericsson's mobile phones. Audio Control is run as a sub-project in Sony Ericsson's organization, and is contracted on an outsourced basis. The development is managed in two separate Scrum teams, focusing on different parts of the development, and with test in a separate team outside the Scrum process. This study focuses on one of the teams consisting of five developers, of which one is the Team Leader. This means that he is having both the role of Scrum Master and Product Owner. The project is managed with Scrum for three months.

The customer sorts and prioritizes all requirements, and the project works according to the customer's standards. Hence this study identified Audio Control's customer as Direct Participant, placed at the top of the SCS matrix. The customer is not entirely acting as a project member, is not collocated with the team and does not possess a complete understanding of Scrum. However, the transparence of the project is very high, and the role of the Product Owner is divided

between the customer and the Team Leader. This classifies the customer as Partial Participant, placed to the right in the Partial-Participants box in Figure 3.

If the customer aligns its processes better with Scrum and takes full responsibility as Product Owner, structure and prioritizations could get even clearer in the project. This possible evolution would mean a transition of the customer to the Full-Participants box, also indicated in the figure.
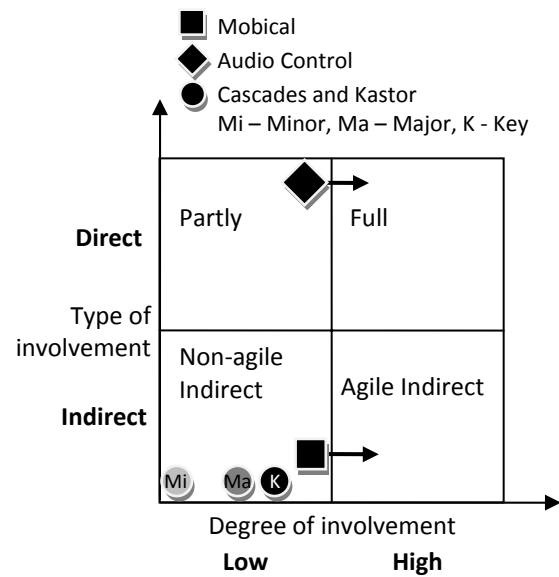

Figure 3 Positions of customers in the SCS

TAT, The Astonishing Tribe, AB (TAT) is a software technology and design company offering products and services for the creation of mobile user interfaces. The development of the two products Cascades and Kastor was studied as the third case.

The development is organized in two Scrum teams – Cascades and Kastor – with about ten respectively six developers. Beside the teams work a Product Owner and two Scrum Masters (one for each team). Test is performed at a separate test department at TAT, not involved in the Scrum process. Scrum has been implemented for about two years.

The products are sold by license with a new software release about every three months, and the customers could be described as *Key customers*, *Major customers* and *Minor customers*.

They all get the same product at the same time, but the key and major customers influence the development more by putting requirements on future releases. Though, none of the customer types are part of the agile process, and the transparency is minimal for each of them. This places all customers in the lowest part of the SCS matrix, as shown in Figure 3.

The minor customers get what is released and seldom influences the development, and are therefore placed at the very left in the Non-agile-Indirect-Participants box. The key customers do not get any customer-specific adaptations of the product, but influence the road map – and with that the development. This ability put them somewhat to the right in the box. The major customers also put pressure on what to develop, but do not get as much attention for their requirements, and they are placed left of the key customers. Future directions for involvement of the customers of Cascades and Kastor are hard to point out. The project is confident in the way the customers currently are approached, and experiences that the development process is well designed to meet the customer's wants and needs.

3.4 The benchmark

The benchmark of the three cases shows big differences in many areas and similarities in other. Some of the differences depend on individuals, some on the customer types and other on the team members' capabilities and commitment. Generally are two or three of the most significant CSFs lower implemented than the other three, and overall Agile Software Engineering Techniques and Team Capability have the lowest scores.

The most complex project – Mobical – has on the whole the lowest degrees of implementation of the CSFs, while the least complex project – Audio Control – has the highest. The result and analysis of the interviews, together with general observations on the case sites, signify that it is harder to implement the drivers in a more complex project. The implementation of the CSFs for all cases is shown in Figure 4.

The drivers that stand out, i.e. are poorly implemented by Mobical alone, mainly consider the team members, their motivation and commitment, and their ability to manage themselves in the complex and hectic project. Engineering techniques is another area which in general is little considered, and where the lack of coding standards stands out as a single practice compared to the other projects. Other areas, where the Cascades and Kastor projects also have low measures, regard vague definition of what *done* means and paying little attention to sprint deliveries. Also the progress tracking and metrics in general are poorly implemented in Mobical as well as in Cascades and Kastor. This is also the case in Audio Control, but this project has not yet seen the need of more explicit metrics.
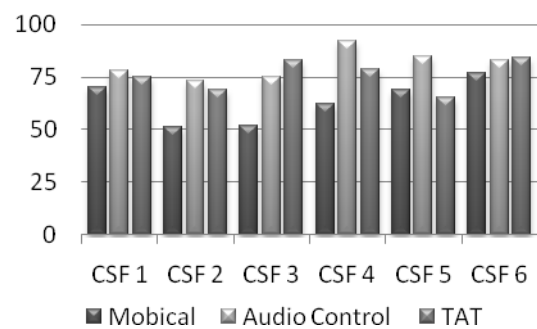

Figure 4 Implementation of the CSFs

The most evident factors underlying the lower implementation of the significant CSFs in Mobical are:

- the absence of criteria for when a task is done
- the adding of too many tasks during the sprints
- team members' shortcomings in motivation, ability to self-organize and common responsibility
- the off-location of the Customer Project Manager
- the lack of metrics making it possible to follow up progress
- the undefined engineering process (coding standards, test routines etc.)

By considering and improving these factors, many of the drivers will be better put into practice, the development process improved, and a better product developed. In this way both the internal working environment and the perceived end-customer value will increase.

4. Discussion

Which drivers of customer value that can be identified in agile practices are described by the CSFs, measuring success in form of customer value. The underlying attributes described by Chow and Cao are evolved and defined as drivers. How to classify customers in matter of participation is presented by the SCS, describing four different customer types.

The SCS and CSF analysis of the cases and the benchmark show how competitors work with Scrum, and outlines a number of areas for Mobical to consider improving its agile process.

This means that the propositions are well answered, and serve as a good foundation in the discussion of the main research question below.

4.1 Research question

Where – for which types of customers and projects – Scrum can be evolved to engage the customers more is related to the Scrum Customer-classification System and the *Benefits/cost ratio model* for customer value. This model, described by Khalifa [11], states that customer value is the difference between *total benefits* (quality, profit, worth etc.) and *total sacrifices* (cost, time, cognitive and physical efforts etc.).

The SCS model outlines four general types of customers; Full Participants, Partial Participants, Agile Indirect Participants, and Non-agile Indirect Participants. Except for the very most Full Participants, all customers could be deeper involved in the agile process; e.g. by learning about it, by taking part in continuous re-prioritizations, by attending meetings, and by undertaking the role of the Product Owner. Though, all of these steps are not always gaining business value. When a project develops a product for more than one customer and the customers not are transparent for each other, they might be contributing with

requirements to consider in a road map or even prioritizing tasks in an own product backlog, but they could not have the role of the Product Owner. This is, accordingly, depending on the type of the project, and as stated in the SCS there are major differences between the direct and indirect participant customers.

Even if a customer could be deeper involved due to project characteristics, it also must expect to benefit from committing to the process. If the customer experiences that the total sacrifices are larger than the total benefits, customer value will not increase but decrease. Therefore, the types of customers that could be more involved in the agile process are the ones expecting benefits with a deeper engagement, and deeper involvement is possible for all kinds of projects – but to different extent.

How – which factors that should be considered – also depends on the customer's position in the SCS. As described above, different customer types can be involved in various ways, which also means that the possibilities to progress are dissimilar. When increasing a customer's degree of involvement it may be transitioned to another customer-type group in the SCS, as shown in Figure 2. Since a customer is classified by the characteristics of its present involvement, the characteristics of the "next" group in the hierarchy are to be considered getting the customers deeper engaged. If the characteristics are applicable, due to the project type and the customer's expectations of sacrifices and benefits, customers can be more involved.

Customer value is created where the customer experiences it. Chow and Cao's study outlines a set of critical factors to implement, considering the right product for the right price at the right time. For a project to ensure success in matter of customer value, the factors should be considered. This means that customer value – direct or indirect – is created by the practices underlying the CSFs – the drivers of customer value.

4.2 Generalizations and limitations

Even though bias is tried to be detected, some of the interviewees may have provided

misrepresenting data, with the result that the CSF analysis generally shows too high or too low results. This makes a direct comparison of critical success factors and drivers between projects irrelevant.

The benchmark compares Mobical to two individual cases selected to get a wider picture of implementations of Scrum, but it could not be said to represent all competitors in the business since the additional cases are selected from a narrow population.

The SCS model is verified to be applicable for rather small software development Scrum projects. Still no contradictions for the SCS to be used in the analysis of larger projects are found by this research, and the model could also be applicable for projects run by other agile methods, but might then need slight adaptations. The relevance of the SCS for agile projects not developing software is not studied; neither are any problems identified for applying the model.

The CSF model is shown to be applicable for the studied cases, and by its theoretical ground it could also be applicable for all agile software development projects independently of size and methodology.

Further research could be done to study the validity of the SCS and CSF models for larger projects and for projects managed with other agile methods than Scrum. The reliability of the results could as well be increased by a quantitative approach, and they could be made representative in a wider context if a larger business segment is studied. These kinds of studies could then result in a theorization of the models.

The results of the study, in matter of the main research question, therefore are representative for small software development Scrum projects. The research also indicates that the results are able to be generalized for larger projects, and with adaptations also to projects run by other agile methods.

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Appendix

Table A:1 Investigation protocol

1	General about the company
1.1	Are there any limitations in publishing the collected data?
1.2	Name of the company?
1.3	Founded?
1.4	What types of products does the company develop?
1.5	Who are the major customers for the company?
1.6	How many employees?
1.7	Multinational?
1.8	Does the company have experience of agile methodologies in several projects?
2	General about the project
2.1	Name of project
2.2	What types of products does the project develop?
2.3	How could the project be described in the company's organization?
2.4	Who are the major customers for the project?
2.5	Is the project using any project management tool?
3	Agile project specifics
3.1	Which agile method or methods are in use?
3.2	For how long has the project been managed with agile methodologies?
3.3	To what extent is the project following the agile practices "by the book"?
4	Group organization
4.1	Total number of people in the project?
4.2	Agile Roles in the project?
4.3	Support Roles in the project?
4.4	Who in the project are responsible for customer relations?
5	General customer characteristics
5.1	Does the project have one or multiple customers? How many? Are there differences between them in size and importance?
5.2	Does the project have a separate backlog for each customer? If not, how does the project handle the requirements?
6	Customer involvement
6.1	Is the customer holding the role of the Product Owner?
6.2	Is the customer owning and prioritizing the Product Backlog?
6.3	Is the customer acting as a project member?
6.4	Is the customer collocated with the team?
6.5	Are the project and all its other customers transparent to this customer?
6.6	How well does the customer know the agile methodology? (0-100%)
6.7	Is the customer allowed to attend any meeting?
6.8	Is the customer attending the sprint reviews?
7	Benefits
7.1	Which main benefits is the project experiencing by the agile methods?

7.2	In which areas does the project identify future potential benefits?

Table A:2 Reinforced model of CSFs, Drivers and SCS customer types

CSFs and Drivers	Customer types			
Explanation of symbols: ● Driver is valid ○ Driver is valid with respect to in-house Product Owner – Driver is not valid	Full Participants	Partial Participants	Agile Indirect Participants	Non-agile Indirect Participants
1. Delivery Strategy				
A. Regular delivery of software; short iterations of equal length	●	●	●	○
B. Delivering most important features first	●	●	●	○
2. Agile Software Engineering Techniques				
A. Well-defined coding standards up front	●	●	●	●
B. Pursuing simple design	●	●	●	●
C. Agile documentation handling	●	●	●	●
D. Agile test process	●	●	●	●
E. Daily builds	●	●	●	●
F. Code completed at demonstration	●	●	●	●
3. Team Capability				
A. Team members with high competence and expertise	●	●	●	●
B. Team members with great motivation and self-discipline	●	●	●	●
C. Managers knowledgeable in agile and having adaptive management style	●	●	●	●
D. Appropriate technical training to team	●	●	●	●
E. Appropriate methodology training to team	●	●	●	●
4. Project management process				
A. Following the agile-oriented requirement management process	●	●	●	○
B. Following the agile-oriented project management process	●	●	●	●
C. Good progress tracking mechanism	●	●	●	●
D. Strong communication focus with daily face-to-face meetings	●	●	○	○
E. Honoring regular working schedule	●	●	●	●
5. Team environment				
A. Co-location of the whole team	●	●	●	●
B. Coherent, self-organizing teamwork	●	●	●	●
C. Projects with small teams	●	●	●	●
D. Projects with no multiple independent teams	●	●	●	●
6. Customer involvement				
A. Good customer relationship	●	●	●	○
B. Strong customer commitment and presence	●	○	○	○
C. Customer having full authority.	●	○	○	○
D. Customers trained in the agile process	●	●	○	○

| E. | Use of target-cost contracts to share risk | ● | ● | ● | – |