A product line organization using an open development method

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Opening access to the source code for a product is a business strategy that is increasingly used as the basis for innovative collaborations with stakeholders. The strategy has been successful at producing a large quantity of high-quality software. A tactic in this strategy is to effectively use the efforts of many widely dispersed professionals. The processes, software tools and the communication mechanisms used to facilitate concurrent development by a large number of people are of as much interest as the software being created. In this position paper we present our view of how a software product line organization might operate if it used an open development method (ODM) but is not necessarily producing open source software. We will describe a hypothetical product line (HPL), which is part speculation, part our experience, and partly the experience of others.

In general, an ODM differs from traditional development approaches in the flow of information, the culture of the organization, and the rhythm of activity. These areas directly affect common product line goals such as time to market, quality, and mass customization. There are as many variations in how organizations use an ODM as there are with any development strategy. In our description we will try to point out the implications of some variants. ODMs share some characteristics with agile software development methods such as continuous progress and minimal documentation, but differ in significant ways such as the ODM's ability to facilitate globally distributed development.

Organizational context. Our hypothetical product line (HPL) is being developed by an organization that is interested in innovation and improving how they produce software. The HPL organization decides to use an ODM to guide the development portion of its operation because the leaders believe it will amplify the benefits expected from adopting the product line approach. The organization faces a competitive environment in which it wishes to rapidly respond to a large number of small scale business opportunities using its globally distributed resources. The ODM is expected to provide the agility needed to take advantage of those opportunities.

Information flows. In a product line organization using an ODM, communication needs to flow freely and quickly among the asset and product builders. The HPL wants to include the users of products in that flow of information. Regardless of whether separate teams handle core assets and products or whether the two are integrated, development information including the current state of assets and products should be available immediately and archived for later use. Right sizing the flow of information in the product line organization using an ODM requires a variety of mechanisms to support different types of communication such as mailing lists for short queries and wikis for exchange of larger sized pieces of information. Our HPL organization retains the traditional core asset and product team split. Each team maintains separate wikis and forums but these are open and available for all. Product teams

regularly post problems to the core asset team's forum and make requests using the core asset team's bugzilla. A member of the core asset team is assigned to monitor the forum pages and answer questions rapidly or forward them on to others with better information.

Improving the flow of information enables the organization to speed up the rhythm of development. Open source projects have an approach in which the software is always available. In most projects this takes the form of a hierarchy of increasingly reliable builds: nightly, stable, and release builds. Developers can examine the test reports and other information to determine how reliable each of the builds is. In the HPL the core asset team maintains the core asset base in "ready to release" state continually. Bug fixes and newly approved requirements are made available as quickly as possible and in increasingly mature forms. By making bug fixes available as quickly as possible, the heart beat of the product line is more rapid because product builders are able to achieve a build quickly.

Culture. The culture surrounding open source development is becoming more inclusive as the interest in open source increases. Early projects attracted participation either through zealousness about the notion of the right to free software or the possibility of fame and fortune through ancillary activities related to the OSS project. More recently projects such as Eclipse and TOPCASED are dominated by contributors and committers who are assigned by their companies to engage and achieve specific results. This leads to differences in governance and inter-personal interactions. One aspect that remains is the understanding that input from users is critical to the long term success of the project.

Several aspects of the HPL's culture are affected by the ODM. One important aspect is the willingness of developers to participate in reviews. The HPL organization encourages participation by communicating the percentages of defects found in each development phase and challenging developers to push the percentages higher in the earlier phases. Reviews are run as projects with specific time allocations for review participation. In fact Lussier suggests that reviews be given a higher priority than new development [Lussier 04]. Defects found are added to the appropriate bugzilla and assigned to the owner of the asset for correction. The HPL organization believes the time spent in reviews will be returned by reducing time used for correcting defects late in the project.

One of the strengths of an open source organization is the ecosystem that builds around the open source project. The HPL organization operates in the context of its parent organization. The openness of the ODM will allow other units in the parent organization to observe its operation. Those units may see ways to collaborate with the product line to use some of the assets as part of non-product line products or they may offer products that complement the products of the product line.

Structure. The HPL organization recognizes the need for a flatter, more responsive organizational structure. Each asset owner has responsibility for the development and maintenance of the asset and that owner has authority as the committer to approve updates to the asset in the code base. The asset owner maintains a prioritized task list from which team members select work, but the commercial nature of the HPL organization allows managers to allocate resources to ensure that priorities and schedules are met. Asset owners are chosen based on domain knowledge and previous work on the project.

Processes. The HPL organization wants to make the development processes first class entities rather than implicit artifacts that even if written down are overshadowed by day-to-day demands. Developing process models will be approached from the perspective of providing a basis for process discussions in the community rather than a perspective of restricting the actions of developers. Using the Eclipse Process Framework Composer, information can be captured when possible and a library of role descriptions, activities, and tools will evolve. This will be used to aid in communication with participants that are globally distributed.

The HPL organization has modified several processes to more fully involve users. The organization provides users with a roadmap that describes the sequence of products and the anticipated new features for already deployed products. Users provide feedback about product failures and request new features or change of priority among anticipated features. Providing these mechanisms carries with it the obligation to be responsive to the suggestions and questions. Members of every team in the HPL are assigned responsibility to respond to users. Assigning specific people ensures that queries on the user forums get timely responses.

The HPL organization recognizes the need to harness user innovation. The product line architecture is designed to allow for plug-ins of features. The HPL organization provides means by which users can request specific new features, changes to existing features, or upload and share with the community their own implementations of features.

Our interests. We are interested in a number of issues related to the interaction between open source methods and software product lines:

1. Exactly which aspects of an ODM make it attractive to a SPL organization?

2. Which facets of an ODM degrade when used in a commercial product line environment?

3. Does the use of an ODM better support traditional production qualities, such as faster time to market and higher quality products, than other SPL development approaches?

4. What aspects of user involvement are effective in a SPL environment?

References

Stephane Lussier, New Tricks: How Open Source Changed the Way My Team Works, IEEE Software, 2004.