

Consumers as Co-Developers

Learning and innovation outside the firm

Lars Bo Jeppesen * Ψ

lbj.ivs@cbs.dk

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Måns J. Molin *

* Copenhagen Business School,
Department of Industrial Economics and Strategy,
Howitzvej 60, DK-2000 Frederiksberg,
Denmark.

Ψ Centre for Economic and Business Research,
The Danish Ministry of Economic and Business Affairs,
Langelinie Allé 17, DK-2100 Copenhagen Ø,
Denmark.

Abstract: This study describes a process in which a firm relies on an external consumer community for innovation. While it has been recognized that users may sometimes innovate, little is known about what commercial firms can do to motivate and capture such innovations and their related benefits. We contribute to the strategy literature by suggesting that learning and innovation efforts from which a firm may benefit need not necessarily be located within the organization, but may well reside in the consumer environment. We also contribute to the existing theory on “user-driven innovation” by showing what firms purposively can do to generate consumer innovation efforts. An explorative case study shows that consumer innovation can be structured, motivated, and partly organized by a commercial firm that lays out the infrastructure for interactive learning by consumers in a public online domain.

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1. Introduction

In contrast to internal corporate ventures (von Hippel, 1977; Burgelman, 1983), innovation and product development in the computer games industry depend upon external online consumer communities. This turns the idea of core competencies (Prahalad and Hamel, 1990) and non-imitability (Dierickx and Cool, 1989) on its head since a major share of the competencies in effect are public and reside outside the firm. Computer game consumers participate in online communities where they communicate, exchange ideas and software that extend the game from its original shape. Hence, in this setting, strategy formation is not just about creating and placing a product in the market; it also demands skills to frame and generate a consumer community external to the firm that co-develops and extends the product life. This paper aims to 1) showing how consumers co-develop a commercial product for free, 2) identify the most important dispositional features of this form, and 3) show the importance of consumer-to-consumer (C-to-C) interaction and learning for product development and innovation within this setting.

Traditionally, theories have focused on competencies, knowledge, and learning within or between firms (Duncan and Weiss, 1979; Kogut and Zander, 1992; Doz, 1996; Senker and Sharp, 1997). However, in the computer games industry we find several examples where product related competencies and learning (on certain technological levels) are as advanced in the consumer environment as inside the firm. The overlap between resources and organization, and the firm's relation to its environment thus becomes blurred.

Specifically we have studied the consumer community associated with the computer game *Command & Conquer: Red Alert 2* (C&C-RA2) at the Internet location Red Alert Forum (RAF). Here players can, and are even encouraged to, extend the product with add-ons and new content. Consequently, the firm has several sources of learning and innovation—organizational, employee, and consumer community. In this paper, we focus on processes of interactive learning in the consumer community that facilitates consumer innovation. Economically, the effect

of consumer activity is of high value to the firm. Instead of hiring a computer games art designer, the consumers are doing the job for free.

The study focuses on two elements: first, a set of interwoven features, which are dispositional of this organizational form, and second, interactive consumer learning processes driving innovation in this setting. We illustrate how a firm (from the computer games industry) employs online consumer communities together with “user toolkits for innovation” (von Hippel, 2001) to form a “community-of-practices” (Brown and Duguid, 1991) in which consumer-to-consumer interactive learning unfolds and leads to concrete innovations from which the firm benefits.

We draw on conversations from the online consumer community to illustrate interactive consumer learning processes. The analysis details learning taking place on different levels: lower level consumer learning in relation to consumers’ use of tools, higher level consumer learning in which the tools are altered, and the emergence and convergence of design norms through interactive consumer learning which upholds the direction of learning.

By this study we intend to add to an emerging literature concerning innovation by users in community settings. Such innovation processes have formerly been studied in face-to-face settings by Lüthje (2002) and Franke and Shah (2003), and as well as in the open source programming environment (Lakhani and von Hippel, 2003 in press) where communities are ICT-based. Our study differs in focus from those studies in that it approaches a community based user innovation processes, which is *established* by commercial firms.

Thus, the processes outlined in the study have implications for product development and may be seen as an attractive strategy to some firms. We conclude by portraying the strategy process that emerges in the consumer-based product development process outside the firm, when the firm’s own strategy is cross-fertilized with that of an active and forward moving consumer community. Further, managerial considerations are made concerning the degree of openness that firms should provide their consumers to influence product development, and how consumers are best introduced to learning and tool use.

2. Learning and Innovation Outside the Firm

A number of firms in the computer games industry have learned to utilize online consumer communities as a source of learning and innovation for product development. The innovative activities of consumers in online communities influence the success of a computer game in several ways and can be seen as a dimension of the product in that it constantly provides the game with new designs. There are two kinds of innovative processes in the consumer online community: one that breed new content to the product and another that delivers ideas for new versions of products or genuinely new products. The direct effect, in economic terms is manifested through savings on the creation of new content that extends the life of each of the product versionsⁱ.

2.1 A technological trend facilitating interactive learning

While innovative consumer communities can emerge also in face-to-face settings (Franke and Shah, 2003), the technical milieu of this case is extraordinary in facilitating interaction. Different technological/industrial areas - telecommunication, broadcasting, and computing (see Figure 1) - converge in the creation of this technological milieu (Miles, 1997). It is not only the community that uses Information and Communication Technologies (ICT) for interaction, but also the game itself is ICT-based. Thus, the technical milieu is not unfamiliar to the community members.

<Insert figure 1 >

ⁱ Consumers carry out work that traditionally was done by computer game manufacturers. For example, when a manufacturer develops a new map in-house by employing a professional art designer, who on average earns US\$ 59,612 per year (www.gamasutra.com/features/20010831/survey_01.htm) and typically spends ten days to create a high quality map, the cost of a single quality map is US\$ 2,980. Consumers frequently make maps of comparable quality. Westwood Studios have chosen to have 8-12 consumer made maps continuously available for download at their site side by side with an equally number of maps made by professionals employees.

ICT is a development of different technological/industrial areas as illustrated in Figure 1. Miles captures this trend in the: “What sorts of product space can be carved out in cyberspace?” (Miles, 1997). Some firms in the computer games industry have the answer to this question; they now exploit this new product space in two ways. First, they develop games that function via the Internet, and second, they establish ways of communication among consumers and between themselves and consumers. This is the product space of the computer game industry. When the firm lets go of it, the product continues to develop in the online communities, mostly through the continuous uploading of maps (new content) by fans. As an online community manager says “at the end of the day /.../ all of our fans are sitting out there getting maps; it extends the life of the product”.

2.2 Community-based toolkit learning

An online community has its strengths and weaknesses, as does a face-to-face community. One of the most important strengths of an online community is its capacity for interactive broadcasting on a global scale (Etzioni and Etzioni, 1999). Further, it has been shown that despite its “face-to-facelessness”, the online community can carry many of the social abilities, which many did not believe it could handle (Special Issue: Communication Processes for Virtual Organizations, Organization Science, 1999). On the community level, practices evolve in a manner similar to that of “communities of practice” (Brown and Duguid, 1991) and “situated learning” (Tyre and von Hippel, 1997), in which learning occurs through people interacting *in context*. Here, learning is often enhanced because people may confront different sorts of clues, gather different kinds of data, use different tools, and experience different pressures in relation to a given problem.

By providing consumers with a “user toolkit” (von Hippel, 2001) that helps them to elaborate the original product the consumer driven innovation strategy exploits consumers’ “sticky” need-related information on location (von Hippel, 1994; von Hippel, 1998). When consumers carry out problem-solving activities, they save the firm a number of costly iterations of such information between consumer and product developer, which are traditionally required to reach satisfactory product

concepts. In our case, the consumer is not a “solitary toolkit user” who must rely solely on “learning by doing at home”, but a community goer who easily benefits from interactive learning processes in a focused environment, in which consumers who share similar tools and problem-solving issues interact intensively.

The consumer community works as an input and inspiration for developing, not only new versions of a specific game, but for the creation of new games in general. Having a strategy that allows a firm to benefit from consumer contributions has since the late 1990s been critical to the speed of product development and generates a longer product life in the computer games industry. An executive of product development at Westwood Studios illustrates this point with the statement: “...the online communities are ways to get the feedback that we need...and these guys, they help us ultimately to better our product”.

To illustrate how consumers in the community learn about and within different technological levels we draw on parts of the organizational learning literature. The research tradition of organizational learning comprises several features, such as communication, interaction, feedback, shared meaning, and especially learning on different levels, all of which are crucial for a viable firm (Shrivastava, 1983; Fiol and Lyles, 1985; Levitt and March, 1988; Weick and Westley, 1996; Easterby-Smith, Crossan, and Nicolini, 2000). The organizational learning tradition helps to show the importance of such features for consumer learning in an online community and illustrates how consumer know-how in the community is the outcome of learning at different levels. Here it is not the organization itself that learns; rather, the strategy is to extend the learning of the organization to an outside community.

3. Research Design

We chose an explorative case study method (Yin, 1994) as an approach to the processes of learning and innovation outside the firm. Thus, this paper does not take the road from theory to reality it uses reality to explore the possibilities of new product development methods. We do not aim at establishing generality in the classical sense, by arguing that the approaches sketched out in the study are easily

employable in any firm or industry; instead, we try to discuss the prerequisites for and prospects of this new development. Concerns about external validity were traded off against the opportunities to gain insight into an, up to now, largely undocumented phenomena.

As referred to in the introduction, our empirical source is the RAF where we followed ongoing discussions and exchanges over longer periods. We also visited vast amount of homepages that serve as online archives (web logs) with information concerning the processes that we describe in this paper. Further, we have interviewed managers in leading computer games firms. Specifically we interviewed several managers in different positions of Westwood Studios. The majority of the interviewed people are employed in online community management and product development.

In the empirical section we will use different forms of interaction as examples of different learning levels. The examples are chosen because they illustrate a clear punctuation of a learning process. We present three interactions of which two are associated and show how interaction leads to learning and hence to a concrete although mediocre map innovation.

3.1. Background history and the development of Westwood Studios' online presence

The use of online communities to gather consumers is a widespread practice in the computer games industry. A recent survey (Jeppesen, 2002) 94 computer game products reveals that 83% of all computer games product offer producer established online communities while 35% offer both community and toolkits. Our subject matter - C&C-RA2 - belongs to the latter group that has both a community and toolkit and represents therefore an excellent context in which to study C-to-C interaction and its relation to innovation.

Westwood Studios, the creator of C&C-RA2, was founded in 1985. The firm has developed an extensive list of successful titles. Thus, in the year 2001 the firm had two titles among the top 20 of best selling computer games in the US.

Westwood Studios was one of the first firms in the industry to have a strong interactive presence on the Internet and was an early mover into creating online

based gaming. Westwood Studio's online presence was initiated in 1994 when three marketing-PR managers established a number of chat rooms. On the background of these initial experiences with barely a hundred gamers in the chat rooms, Westwood Studio's managers discovered the potential advantages of maintaining ongoing interactions with their consumers and subsequently decided to investigate how to take their communication with consumers to a more advanced level.

Since then, Westwood Studios has gradually fostered a strategy for online communication and online gaming within its own domain. Following an incremental/emergent strategy process (Lindblom, 1959; Quinn, 1980; Mintzberg and Waters, 1985; Johnson, 1988) the firm focuses gradually more on the online community issue. In 1995-1996, when the Internet became mainstream, the community really started to grow. At this point in time Westwood Studios hired its first employee whose job was to engage with consumers in the online domain. Little more than a year later Westwood began to execute a real strategy for the online community by recruiting and re-organizing a number of departments to deal with "online community management". When the precursor of C&C-RA2 Command and Conquer: Red Alert — was marketed late in 1996, it set sales records globally and re-defined its segment, the real-time strategy genre. Two years later, in 1998, Westwood Studios made its best selling achievement to date with the Command & Conquer series' Tiberian Sun game with initial sales of 2 million units worldwide. At that time, Westwood Studios established the now renowned online community located at "Westwood Online", which permits consumers to meet, discuss, and to challenge each other in online tournaments. C&C-RA2, which followed up on the universe of Red Alert was released October, 25, 2000 while RAF was set up (as sub-branch of Westwood Online) already in July the same year in order to spur interest in the consumer environment prior to C&C-RA2 release. By 2001, Westwood Online had grown into one of the Internet's most popular online gaming sites in which a crowd of more than 50,000 gamers played over 500,000 games every week.

4. The foundations of consumer learning and innovation outside the firm

Three interwoven and dispositional features of consumer learning and innovation are outline below. The product developing consumer community encompasses: (a) consumer motivations, (b) presence of certain consumer types, and (c) an appropriate arrangement of the firm constructed design limits (including the availability of toolkits for consumers).

4.1. Intrinsic and extrinsic motivations: the joy of innovating and peer recognition

Both intrinsic and extrinsic sources of motivation help us understand community based consumer innovation. In our case (computer games with toolkits), it is rather difficult to distinguish whether the consumers play to play or play to develop the game. It is important to point out that “play” in this context is an intrinsic motivation that drives development, learning, and innovation. We call this overlap the “play to play and play to develop overlap”, emphasizing that an actively involved person gets as much out of developing extensions to the game as of using the product for its conventional purpose. Playing is thus fundamental for motivation and learning in this setting (Huizinga, 1950; Csikszentmihalyi, 1996).

However, there is also a social driver of motivation that must be taken into account; people are not solely driven by intrinsic motivation participate in communities. Gamers often spend months working on developing new features to a particular game, which they later publish on the Internet and make openly available for download to fellow gamers. Parallel to what has been described in the open source programming context (Lerner and Tirole, 2002), peer recognition of online communities also plays a major role in providing the incentives that impel gamers’ development efforts and motivate them to diffuse their innovations freely to a broad public. The mutual visibility of this environment favors practices of peer recognition – everybody can easily see what everybody publishes.

The play to play and play to develop overlap and peer recognition are not features restricted to online communities, but they have long been present in face-to-face communities and help to explain user-driven innovation in such communities. The online communities have their counterparts in, for example the Harley Davidson motorcycle community studied by, in which users’ activities through time have

resulted in several innovative attributes to that product. To be part of a Harley Davidson group, some features of your motorbike need to be re-engineered versions of the original, and it is well known that bikers are more than willing to show off these features of an exhibition or in a gathering (Schouten and McAlexander, 1995) to get recognition from peers in the community.

4.2. Consumer types and interaction

Although it has been recognized that end-users may occasionally innovate there are disparities between them in terms of their readiness, interest, and capabilities to do so. The presence of certain types of consumers is necessary for the consumer innovation processes that drive consumer learning and innovation. In our practical field, for instance, far from all consumers are interested in developing maps for the game. We find it useful to distinguish between three types of consumers.

Consumer 1 uses the product and develops innovative applications: he has relatively deep and specific knowledge of certain aspects of the product and he updates himself by interacting with peers. Consumer 1s are best characterized as lead users; a minority of individuals in a user segment who face needs which will come to be general in a market place but face them before most others. Further, lead users expect to benefit by obtaining a solution to those needs. (von Hippel, 1986). In our case, Consumer 1 is one who plays the game and develops new additional features; he has a good knowledge of the game, its related tools, and he frequently plays and interacts online.

Consumer 2 is basically a product user, who participates actively in interactions with other product users in their discussion of user-related issues, but shows no innovative efforts in relation to product development. In our case, the Consumer 2 is a game player who plays mostly online against others of his kind. Consumer 3 is essentially a passive consumer, who uses the product alone and does not communicate with others concerning the product. In our case, he is the type who plays predominantly against his own computer. As the consumer types are discriminated on the basis of their (alterable) relation to the game, there is a possibility of movement between these groups. Usually the Consumer 3 is only a

transitory phase that must be passed through before entering the other consumer type-groups.

<Insert Figure 2>

An important facet of product development outside the firm is the act by which a Consumer 1 creates a new map that Consumer 2 or 3 downloads and uses. In this paper we will focus on Consumer 1's C-to-C learning that leads to innovation from which Consumers 2 and 3 benefits. Hence, Consumer 1 is our innovator; he generates new maps and new know-how on map building and the game through interaction with other consumers in the community.

4.3. Product character and firm constructed design limits

Intentionally or not, most consumer goods have some solution space (von Hippel, 2001) open to consumers. How the firm structures and deals with the solution space will have implications for the scope of consumer innovation and hence for firms' possibilities of drawing systematically on consumers for innovation.

From a technical perspective the computer game can be separated into three different levels: software engine, graphics structure, and maps (see Figure 3). A so-called editor Final Alert 2 (FA2) that allows consumers to create new maps is available to the game. It provides modularity between consumer made maps and the graphics structure.

<Insert Figure 3>

There is a technical limit to what one can do with an engine, a graphics structure, and an editor, which is set by the firm. We call this limit the *firm constructed design limit* and the space that it creates for consumer innovation the solution space. As we will discuss below, this limit and space is not necessarily definite for the consumers. The game that we focus on is a firm-built graphics structure that functions on the firm-built software engine called Command & Conquer, which makes up the name of the

full product C&C-RA2. This product has a number of sister products, such as Command & Conquer: Renegade, Yuri's Revenge; Generals, and Tiberian Sun, which together go under the label "The Command & Conquer Series". They are sister products in the sense that they share the same engine, which makes them compatible for drawing on each other's product development and innovation. For example, highly skilled Consumer 1's from the C&C-RA2 community have participated in the development of the upcoming game C&C-Generals.

The recent history of computer games reveals examples of deep degrees consumer innovations. There are examples of single consumers who have constructed a game from the graphics structure and above. An excellent example of this is Half-life: Counter-Strike. Half-life was an existing game that Minh Lee thought had a potential engine on which one could build a much better game. Minh Lee - a student at that time - therefore used Half-life's engine to create his own game named Counter-Strike. Less than one year after the release of the first infant version in June 1999, Counter-Strike was one of the most demanded online games ever. Enthusiasts in the online worlds surrounding Minh Lee had taken on most of the responsibilities of additional content creation on the map level, thus adding crucial content to the game. Since everyone who wants to play Counter-Strike has to buy the "engine carrier" Half-life the appearance of Counter-Strike led to a huge economic success for Half-life's creators Valve Inc.

In order to have product development outside the firm Consumers 1s must be enabled to take over some central tasks of that process. In our case it was, in fact, through a deep consumer innovation (similar to that of Minh Lee) that such a "task relocation" from manufacturers to consumers was made possible. In 1998, a 16-year-old German computer gamer built a so-called editor to C&C-RA2. Final Alert (currently FA2), as the editor came to be known, gives consumers access to a solution space of the top layer of the firm constructed design limit, namely, the map level. It thus facilitates consumer map-making and secures compatibility between consumer made maps and the graphics structure, so that consumer creations can be used in the game.

Thus, the possibility for consumer innovation is itself a consumer innovation. Although Westwood Studios did distribute FA2, the initiative for developing this

toolkit did not come from within Westwood Studios. The professional editor that Westwood Studios' own art designers had used to create the maps for the original version was not released to the consumer community because it was "so complex it would have just confused and baffled many of our fans" as an online community manager explains. "But in the community there was a 16-year-old kid by the name of Mathias in Germany who created a utility called Final Alert 2...it was a map editor with a lot of good ideas and it was really easy to use. /.../ We said /.../ you know what, we got to get this in".

Westwood Studios contacted Mathias, and from there on the producer of C&C-RA2 "worked with Mathias to get the toolkit up to production values". Hence, the very possibility for consumer innovation is to a large degree an outcome of a prior consumer innovation. The story of Mathias relates to the broader strategy process of Westwood Studios, discussed in section 2.1: Mathias opened Westwood's eyes to the issue of user-friendliness of the editor. This again underlines the point of strategy being an incremental process involving as much search and creation as planning (in this case heavily influenced by consumers). Further, this particular case illustrates how some consumers are capable of innovating at deeper levels than the firm invites them to do.

FA2 is the incarnation of what von Hippel and co-authors (von Hippel, 2001; Thomke and von Hippel, 2002; von Hippel and Katz, 2002) recently have labeled "user toolkits for innovation". The authors expect that allowing consumer to take part in product development by user toolkit for innovation is the method by which future product development will be carried out when high degrees of customization are demanded. The method is attractive to manufacturers because it allows them to abandon some of their frustrating attempts at understanding consumers' needs accurately and in detail by outsourcing need-related tasks of product development to those consumers who possess those needs. The method thus frees the manufacturer from attempts at sourcing "sticky" information (von Hippel, 1994) and allows them to create the products and features that consumers want. Further, by letting consumers do design work themselves, they are allowed to alter and re-design their creation as they go through learning processes.

<Insert Figure 4>

Thomke and von Hippel (Thomke and von Hippel, 2002) illustrate (see figure 4) how the toolkit approach works at the level of the individual user. In the case that we deal with here, the toolkit has been added a crucial dimension (illustrated in Figure 5), namely the consumer community. In the consumer community, C-to-C interaction fuels consumer tool learning. In a community based toolkit approach, the exchange of need-related information and problems-solving information that can lead to improved products features is here taking place on a C-to-C basis.

<Insert Figure 5>

In our case interaction and its outcomes (new product content) is taking place in a public domain. The active consumer community is not a closed private entity like a firm or other organization; every person is allowed to access. In the solitary form of toolkit use, the consumer is limited to “learning by doing at home” while in the C&C-RA2 case, communication on a global basis facilitates intense interactive learning among a group of individuals who uses identical toolkits in relation to the same product. They draw easily on each other’s experiences and competencies.

5. Consumer learning by interaction

In the last section we discussed the features that constitute a product development outside the firm. In this section we will show the more dynamic processes through which C-to-C interaction upholds the community and generates learning and innovation in the product space. We focus on RAF, which is a typical location for Consumer 1s to meet, exchange ideas, and solve problems related to the issue of map-building for C&C-RA2. We will do this by presenting a number of C-to-C interactions that illustrate different kinds of learning. A learning community like this will develop certain practices that help consumers to communicate about their

problems. This includes language (abbreviations), behavioral codes, etiquette, and norms, elements that also frame the direction of learning.

In Interactions 1 and 2, we follow a novice mapmaker through the community. His result (a map published at a refereed site) is quite mediocre, but his story provides a picture of what goes on at RAF. Interaction 3 shows a more complicated situation in which consumers (together with an online community manager) communicate about a problem that cannot be fully solved within the existing commands (computer language) of the editor.

To understand these interactions from a learning perspective we first distinguish between lower and higher level learning (Argyris and Schön, 1978; March, 1991; Kuhn, 1996). Lower level learning is structured by the firm constructed design limit - in this case engine, graphics structure, and editor. This learning is a technical learning concerned with how to handle the existing functions and programming language of the editor. Higher-level learning takes place where these limits are contested. The distinction of lower- and higher level learning (in our case the design limit) is fuzzy; the distinction possesses its own dynamics; lower level learning will run into problems that cannot be solved without simultaneous higher level learning (Argyris and Schön, 1978; Kuhn, 1996).

Interaction 1: Bumping into the design limitⁱⁱ

Blkwaltz3 - the community member whom we follow in the first two interactions - attempts to build a map, but runs into problems. Instead of turning to a manual or the firm, he logs on to the online community where he can learn from peers in order to solve his problem. He has a specific problem, which he addresses directly to a prominent community veteran, Wildefire.

Blkwaltz3 (Rookie)

ⁱⁱ It should be mentioned that the material is presented in an unedited form. Therefore we see many examples of misspellings and abbreviations. We have left the text in its original form to give the reader a realistic experience of these environments and as an illustration of the fact that the community practices also involve a specific vocabulary.

Wildefire, Since you are great at mapmaking, and have helped ppl in the past, I would like you to take a look at a raised bridge problem i've been having on a map of mine...I cant really explain the problem here without creating confusion, but if I could just send it to you, then maybe you could tell me whats wrong, and fix it...If you can't thats okay too! thanks!

In her response, Wildefire expresses concerns about time; she is currently busy helping out other participants.

Wildefire (Officer)

Blkwaltz3, I'd love to help you but I'm totally buried under RA2 stuff. In fact, I'm sure there are quite a few people on this board who are really p*ssed at me because I haven't gotten around to their maps yet.

Wildefire's time concerns illustrates the level of engagement that the most industrious individuals show to the community; she is 'totally buried under RA2 stuff' performing customer support activities for free.

Blkwaltz3 shows his understanding of Wildefire's time constraints. Nevertheless he addresses his specific problem to the community in general.

Blkwaltz3 (Rookie)

Well, okay! I understand...Ill just try and fix it myself....but its a stupid thing...i have made a Big Bridge [in the air] and it is up on 2 cliff highths (8 tiles up) and I can make the bridge all the way up till 2 spots near the other side....then the bridge wont create when using the bridge command in the left hand drop menu, and when I try putting the pieces in there manually, it wont let me....and i cant finish my map...(sniffle)....Anyway, good luck on those other maps !

Following Blkwaltz3 problem specification Wildefire is able derive the point; despite her time concerns she responds:

Wildefire (Officer)

Oh my! I think I know already what your problem is. IIRC, you can't place bridges 8 tiles high (from cliffs on top of cliffs). Someone will correct me (I hope not abusively) if I'm wrong. Hey, and thanks for understanding my plight.

Wildefire's statement gets extended and verified by Almighty who elaborates the explication. Almighty also gets recognition from Wildefire for his knowledge on the area.

Almyghty (Officer)

Bridges cannot cross an area eight or more levels higher than the ground below. I would assume that the game is programmed to expect bridge overlay (for high bridges) to be four levels above the terrain or water. In case you've never tried it yet, you also cannot have a high bridge pass across a low bridge; one bridge or the other will have overlay missing where they cross.

Wildefire (Officer)

Hehehe! I was hoping that Almyghty, our bridge expert, would weigh in here.

Blkwaltz3 (Rookie)

Well...isnt that just a spooty spoot-head.....and I was gonna make it all nice and everything.....aw, poo!

With the assistance of two community high rankers, Wildefire and Almighty, Blkwaltz3 discovered that his problem was of a simple kind and that his efforts put into bridge building were likely to prove fruitless.

This interaction is a good illustration of C-to-C multi-iterative problem solving that leads to lower-level learning. It is lower-level learning because gamers learn how to handle the solution space offered by the editor. In this case the limit is very clear-cut — 'Bridges cannot cross an area eight or more levels higher than the ground below' — and thus what we see here is a simple "detection and correction of error" (Argyris and Schön, 1978 p. 2) that Blkwaltz3 does with the help of the community. Almighty's contribution also illustrates the quality of community learning as opposed to bilateral learning; his more nuanced description deepens the learning processⁱⁱⁱ.

ⁱⁱⁱ These interactions are saved in RAF and can later be found via a search system. In this sense, the RAF becomes an evolving consumer support library or manual that can be used to answer all kind of questions. We find several internal references within the library. There is an established community practice, which is to search the RAF before posing questions that might have been solved earlier, but also to unburden high-ranking members such as Wildefire.

Interaction 2: The convergence of design norms - What is a good map?

Consumer 1s often offer their maps to the RAF community for peer review. When other Consumer 1s have tried out the map they openly express their valuations of the map at RAF. Reviews are numerous and sometimes subjective, but often valid for improvement. The review process is a kind of bonding which is important for the community and creates important design norms. “The reason that broad-based feedback (that from many to many) is needed is to allow those who broadcast to take into account the reactions they engender in a summary and continuous manner” (Etzioni and Etzioni, 1999 p. 244).

Norms of visual designs will emerge within the community that govern what consumers will actually create with their tools - all possible outcomes are not desirable solutions. Interaction 2 illustrates this with the notion “natural”, around which the map-developers gather to discuss the meaning of the term. However, the visual design norms overlap with more technical dimension of map building in that different tools and tutorials are recommended, depending on what is to be created. The language convergence and practice (Cook and Yanow, 1993; Fiol, 1994; Weick and Westley, 1996) are a reflection of emerging visual design norms that guides the direction of community learning.

In order to illustrate how community participants generate and use specific terms in relation to map building we take point of departure in a representative example in which Blkwaltz3 appears again as initiator of a discussion concerning one central aspect of “a good map”, namely the “natural” aspect. In the following communication the topic-starter expresses his dissatisfaction about valuation and criteria for the publication of maps on a recognized and refereed satellite map site related to RA2:

blkwaltz3 (Rookie)

Okay. Im not trying to b1tch or gain any sympathy, but i just have this to say: FACT: Most ppl like to have hugely detailed\modded maps, and forthe most part, don't even consider natural maps as “realistic” maps becuae they lack said details. On the contrary. Look at it this way. WW2...fought with Nuclear Monkeys and Tesla Brutes on desert maps with 50 pyramids?...no....Fought in the harsh wilderness, small villages, and open plains of Europe?...yes....Nuclear Monkeys? No...Harsh wilderness?...Yes....see? Just becuae a “natural map” (one deviod of any buildings\special stuff) , In my opinionn, can be just as fun.....but I

still haven't won a Lion Thumbs Up^{iv} yet....But I have submitted a 200x200 Natural Temperate map recently, and if it gets posted, maybe you should give it a try. Natural maps are fun for long battles and "no distraction" skirmishes over huge areas....maybe you will agree....okay...im good now....just had to release that from my system! Have fun!

The first response, Silverfox (Officer) points at other features of natural and hints that Blkwaltz3 has misunderstood the content of the term.

SilverFox (Officer)

Natural does not mean boring terrain and low detail (wich is probably why you haven't won a thumbs up award), btw 200x200 is too big.

As we also can see the technical issue is also important for the quality of a map. In the next response by Sypher_5 (Rookie), the technical issue is reemphasized.

Sypher_5 (Rookie)

200x200 will lag the game. Especially if u start adding trees etc. I can fit 6 players nicely with room to spare in a 100x100 map. 120x120 should fit 8 nicely.

In a subsequent response the conceptual discussion around natural reappears; Wildefire (Officer) continues:

Wildefire (Officer)

Blkwaltz, I agree wholeheartedly with you about "natural" maps. In fact, most of mine are visually like that. And I can't tell you how strongly I agree about how so many people "junk" maps up by putting weird things on maps that have no business being together on the same map (landmarks from cities all over the world, etc.). And I also totally agree with you about ridiculous units like Tesla Brutes and Nuclear monkeys! /.../ However, no matter what size the map, it should be heavily detailed with terrain features, trees, etc. so that it's visually interesting wherever someone centers the screen. Even if players don't specifically notice all of your detailing, if it's nice, it subconsciously enhances the entire playing experience on maps IMHO. And of course, terrain features like cliffs, clumps of trees, and water can have a big impact on tactics, enhancing gameplay when carefully placed. Good luck.

^{iv} Lions Thumbs Up is the highest acknowledgement a map can get on the map-publishing site

The above discussion illustrates the existing disparity of the meaning that various participants attach to the theme natural.

Later RALion - the character who is responsible for the Site to which Blkwaltz3 wants to submit his map for evaluation and publication - enters the discussion:

RALion (Officer)

blkwaltz3.....

Since you have addressed me personally, I will give you an answer, and I'll address a few of my other friends as well =) First, I prefer non-modded maps. I like natural maps with detail. As far as winning a Lion Thumbs up, you've come close. Some people disagree with my choices of who gets whatever. But they are my choices. And I'll stand by them. Your 200X200 map by the way is a bit big. SilverFox and Wildefire even agrees with that. So it won't get posted on RADEN. And I do consider myself able to make decisions on what maps get posted.

blkwaltz3 (Rookie)

Well...I gave it a shot!oh well....i guess ill scale it down a bit, next time....guess you wont like my map I was going to send...andother 200x200, but new urban...TONS of buildings....oh well...maybe next time!!

Thanks Lion.

In the example above, design issues are discussed. Such conceptual discussions around map content will affect future map building, because they frame the process of learning (Brown and Duguid, 1991; Cook and Yanow, 1993; Fiol, 1994; Weick and Westley, 1996; Sadler-Smith and Badger, 1998). Learning here becomes manifested in the convergence of language on the term “natural”. Community goes approximate a common understanding of certain aspects of a “truly natural map”, which later becomes a map-builder’s guide. The “natural” discussion demonstrates an exercise in sticky information iterations taking place on a C-to-C basis in the community. The convergence in language and meaning can be interpreted as a codification process in which the information on the needs of the consumers gradually is un-stuck and condensed into norms. Finally, Blkwaltz3 succeeds in getting his map published. We find it at RALion’s homepage. Blkwaltz3 obviously improved his creation by learning concrete problem-solving from the discussion. Further, he converged

governed by gamer RALion.

sufficiently towards to the community view of “what is a good map” to have his map accepted for publication. However, it appears that the review is not excellent as it reflects the difficulties that Blkwaltz3 had earlier which still affect the quality of the map:

Floating Islands

Creator: Blkwaltz3 | 2-4 player

Floating Islands: MPR format. This is a no frills urban map. No buildings to garrison. You'll be playing on a wide open map. No place to hide. Just build your army and go at it! Plenty of resources. Each base location has four Derricks along with some bunkers to garrison at bridge locations.

The “natural” discussion illustrates how important different aspects of their map creations are to players if they are to become recognized in certain communities. Although there will always be disagreement about terms and they will evolve over time, the discussions in the community will at the same time have a constraining power that restricts the meaning of the term. In this case this force is responsible for the fact that participants know approximately what the community appreciates of a map.

Interaction 3: Transgressing the design limit^v

We have earlier in Interaction 1 seen that consumers may sometimes bump into the design limits. In this interaction, we will show an example of consumers transgressing that limit. Interaction 3 is not only a good example of learning that transgresses the firm constructed design limit; it also highlights an important point for innovation management in general. New ideas cannot be *forced* and need not to be; they will *emerge*, inside as well as outside, the firm. In our case there will always be a group of advanced consumers who have the capacity and fantasy to come up with new ideas and designs. The management issue is not to enforce ideas, but to make room for them to emerge and channel them into an innovation.

^v In these interactions we have cut out most of the technical communication since it would take up too much space and would be incomprehensible to many readers.

In the following interaction, Cannis contests the limit to what his tools can do; in fact, he is transgressing the firm constructed design limit. “As users begin to apply the toolkit to their projects, the more advanced among them will ‘bump up against the edges’ of the solution space on offer and then request the additional capabilities they need to implement their novel designs” (von Hippel and Katz, 2002). In this sense the consumer community pushes the development of the editor and by doing so enhances the solution space. As an online community manager at Westwood Studios says, “in terms of reaching its [the editor’s] limits there are some very creative individuals out there it is true that they could push it”.

Cannis wants the game to be able to identify the number of players within a confined area of the map, but the editor does not have the necessary commands to fulfill his wishes.

Cannis: Officer

How can I test for the existence of a player (human or AI) at each spawn point, so I can then set a variable for each?

Typical for this situation is the intervention of the (firm employed) online community manager who has firm expert knowledge concerning technology issues. The online community manager can help Cannis to some degree, but not all the way to a solution. We enter halfway through the discussion:

Matze: Online community manager

Just got an Idea!

What if you make a Trigger that creates a Team for the Player at a certain location somewhere outside the visible area. The script of this team sets a global PLAYER A EXISTS. As teams are not created if the player doesn_t exist, this should work.

Cannis: Officer

I was already thinking along these lines, but getting script actions to do some of the work didn't occur to me. Good, that should streamline stuff a bit.

Also other people are involved in helping to identify the problem area and to come closer to a solution. For example RVMECH:

RVMECH: Officer

Cannis, I needed to know whether the player existed also.= (I remembered some problems I had with a lose trigger once and it came into good use. Try this.... [...and he goes on with a technical explanation.]

Cannis: Officer

RVMECH, on the face of it this sounds great, especially since with this you should be able to determine if a player who *was* on the map originally has lost and is no longer there. BUT... from what I can see, /.../ this trigger *always* fires, even if all players are on the map. This works for you? If so, how??

They continue to discuss what the different commands do to the game, but never reach a final solution. Though many indirect solutions appear in this discussion, they only ineffectively bypass the problem. The solutions require too much programming to work effectively in the game. They have to use the programming language of the solution space to solve a problem that is located outside of this solution space. Hence, the solution can only be indirect, since the language is not designed to deal with this specific problem. In this sense, the consumers transgress the design limit by using its language but extending its area. The best solution would demand extending the program language of the editor, but Cannis gives up and ask the online community manager to pas on the problem to Westwood Studios for development.

Cannis: Officer

Would you ask someone at WW why they do not have a 'House exists' trigger event?

This would mean altering the firm constructed design limit to give the consumers a greater solution space to “play” with. Cannis specifies a “wished outcome” of his activity, but finds no solution is available with the tools that he currently possesses.

5. Discussion

We have shown processes of interactive consumer learning leading to the creation of new product content. These innovative activities have implications for commercial concerns since they extend the life of products and breed new ideas for future product versions. Learning directed at product development is taking place outside the firm and assures that content is continuously created and enhanced in the consumer environment.

There are three dispositional features of these processes. The first is that developing and using the product should be equally playful and the product should offer a solution space that invokes intrinsic motivation. The environment in which consumer learning should take place must also provide extrinsic motivation: peer recognition promotes free sharing of knowledge and publication in public spaces. Second, the presence of certain consumer types plays a vital role - especially consumers with a deep knowledge of the product are critical for extending the original product. Third, the product's openness to innovation can be affected deliberately by adjusting the firm constructed design limit. Toolkits that let consumers access product development tasks permit them to carry out need-related aspects in certain areas. Toolkits may offer the most outcomes when placed in the context of the consumer community, where consumers can exchange ideas and experiences.

The innovation processes described in this paper goes well beyond conventional approaches to product development, and adds a dimension to our understanding of "user-driven innovation". The fact that innovation may stem from users outside the firm is not new - user-driven innovation has been observed since the 1960s (Enos, 1962; Freeman, 1968; von Hippel, 1976). This paper emphasizes and concretizes the possibility for firms of *creating* a consumer community that generates innovation. Firms are organizing the process of user innovation. It also adds to more recent accounts of innovation by users in community settings (Lüthje, 2002; Franke and Shah, 2003) by illustrating what firms can do to capture benefits from the community based user innovation. By taking a firm perspective, we observe how interaction between the firm and consumers is initiated by the firm that take advantage of a technological milieu to create a playground within which a consumer community can evolve. Here the firm sets up support functions that aid user-driven innovation,

hands out user tools that open a solution space, and uses interactions with consumers systematically to benefit from their efforts and innovation.

We should thus note that a number of new important strategic issues related to user-innovation are now in the hands of firm. As in the case of Mintzberg and Waters' (Mintzberg and Waters, 1985) tension between emergent and deliberate strategy, we also have a tension between a learning consumer community and a deliberate firm strategy, which the computer games firms exploit intensively.

<Insert Figure 6>

Figure 6 illustrates a cross fertilization, through which consumers are actively integrated into the strategy process; hence, we add a downward pointing arrow to the figure of Mintzberg & Waters. The firm's strategy concerns taking advantage of technological opportunities given by ICT to unite consumers and to create tools that lay out the foundation of a "community-of-practices", which generates innovations. In other words, it is the creation of a solution space and a place to meet that generates consumers' learning and hence innovation.

5.1. Levels of consumer learning

Three sorts of learning underpin the consumer innovation processes described; lower- and higher-level learning and emergence of norms.

- Lower-level learning is learning within the given solutions space; learning of toolkit use. Through interaction in the community consumers solve technical problems and learn to master the toolkit, and thus to create better designs. Furthermore, a particular question may receive several responses making the communication more nuanced. This feature gives the learning process a character of community learning as opposed to bilateral learning.
- As all norms, design norms are both focusing and excluding. The design norms appearing in the community gives map-makers an indication of what good designs are. The convergence of design norms thus frames to the community innovation process, makes communication easier and questioning

more focused. All in all it structures the design process and secures that mostly demanded outcomes are produced.

- Higher-level learning is contesting existing tools. It may give rise to radical innovation and functionalities. Aiming at expanding the scope of their tools, the consumers contest the firm constructed design limits. This process can range from demanding a new program language to creating completely new tools. This type of learning can lead to new versions and genuinely new products.

From these learning processes we can draw conclusions of importance for firm strategy. The three learning level are important in that the firm is being cross-fertilized by consumers' innovation and ideas. In other words, consumers are actively helping the firm to reach new product versions and genuinely new products.

- Lower level learning compensate for support and training that firms must often provide to consumers. Thus, help lines aimed to support toolkit users can be saved. Only through lower level learning in the community, consumer design capabilities are enhanced to a level where design work can substitute artwork done by in-house professionals.
- Design norms reveal need-related information of interest for the firm. The norms play the role of quality assurance on content designs and allow the firm to rely on consumer for content creation. Norms guide toolkit-using consumers toward mainly producing design that are demanded by other consumers. Further, norms provide firms with a signal of the general trend in consumers' design.
- Higher-level learning pressures and guides the firm toward new product solutions by offering new technical ideas for new products and new tools. It is likely that the firm can learn new technical solutions from highly skilled consumers whom contests the firm constructed design limits.

From the firm's perspective, it is crucially important that C-to-C help and learning takes place, in that it reduces the effort needed to help and train consumers in tool

use. Furthermore, it is of chief importance to the firm that solutions to certain problems and needs are revealed (through norms and maps) that product developers did not think of themselves. The producer can thus by studying the consumer created maps and by listening in to the discussions in the community learn more about their own products. In some cases, this goes one step further; firms have explored how product developers can work together with consumers whom they encounter in the online community to develop new products by methods very similar to the “lead user method” invented by (von Hippel, 1986).

5.2. Designing the solution space

Firms that know how to draw out an appropriate solution space for their consumers may be able to launch “half-finished” products, which consumers work to conclude. Further, such firms may be able to benefit from dynamics that extend the life of their product. To become an expert in half-finished products the firm needs understand how to design the solution space. Product development managers should ask themselves: where should *we* finish developing our product? How much should *they* (consumers) do? The key difficulties of reaching a perfect product are twofold: first, there is a sticky need-related information problem of what could be a perfect product in consumers’ taste; and second, there is the problem of heterogeneity of consumer needs. Due to these two variables, the firm’s cost of reaching a satisfactory product design will rise exponentially as we approximate the need related aspects of product design (typically the visual parts that are designed in the latter part of the product design process, like paint on a car). Providing consumers with toolkits is one way of overcoming this problem. The question then is the size of solution space that the toolkit should take over. Should the firm make 80% of the design while consumers make the ultimate 20%, and how should a firm approximate the optimal point both in terms of which and how many tasks should be channeled into the hands of consumers?

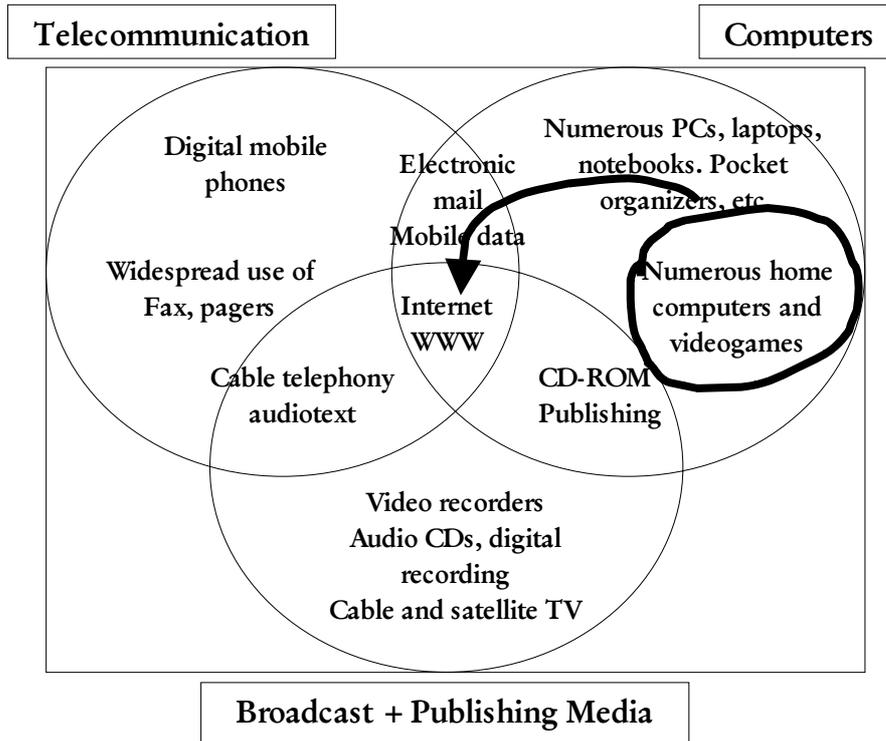
To the producer, handing out toolkits is a way lowering the costs of doing the final need-related aspects of product design – those affected most by the sticky problem. These tasks may be carried out in the consumer community because, from

the consumer perspective, carrying out the tasks is joyful. The motivation may also come from being able to create exactly what one really wants and from being able to show it off to a huge crowd of peers. Mass customization (Lampel and Mintzberg, 1996; Da Silveira, Borenstein, and Fogliatto, 2001) tries to deal with the heterogeneity problem without really integrating the consumer in creative design issues. In contrast, consumers in the RAF community are involved in creative design processes – a process that because of its interactive features helps design norms to evolve.

One should note that the solution space opened to consumers should not be too large because this will hamper innovation. An excessive openness to design by consumers is destructive to product innovation, because consumers may not be able to handle the solution space (it becomes too complicated), and participants may experience problems that are so diverse that they may not be able to start a focused discussion in the community simply because no core issues can be identified. Regarding the latter, a certain degree of structure – “unified diversity” (Fiol, 1994) - is needed, which may generate problem identification for the gamers to have something to discuss. After a while, when the consumers have developed design capabilities, they will be able to handle a larger solution space, and thus, create more advanced consumer innovation.

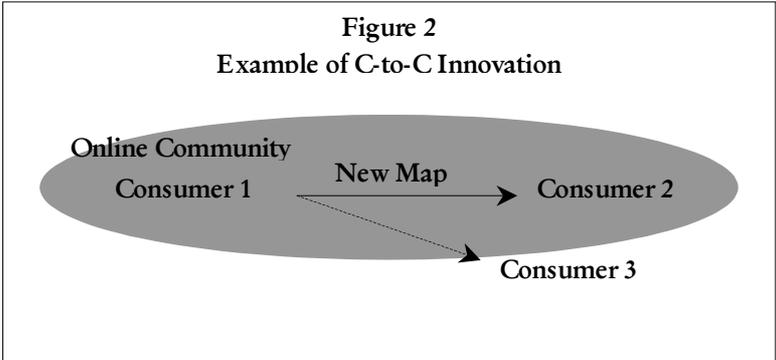
Figures

Figure 1
The Situation in the mid-1990s



Modified after Miles, 1997, p. 779

Figure 2
Example of C-to-C Innovation



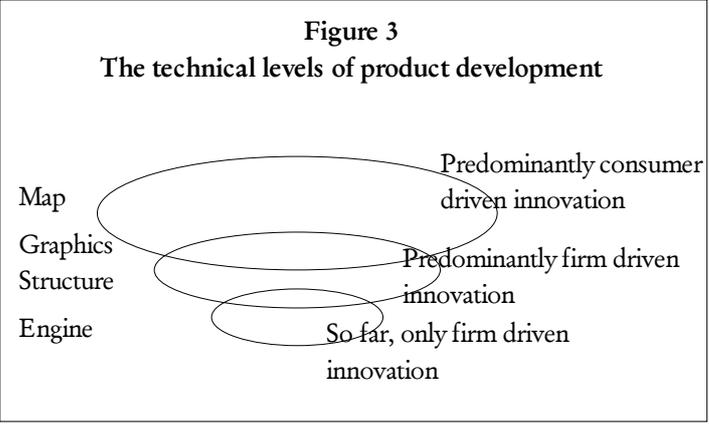
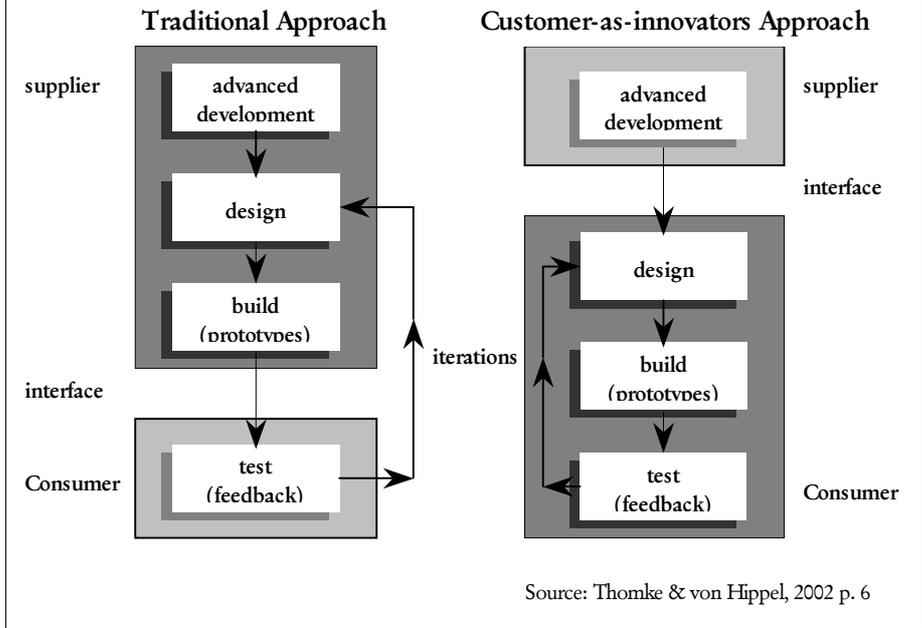


Figure 4

A New Approach to Developing Customer Products



Source: Thomke & von Hippel, 2002 p. 6

Figure 5

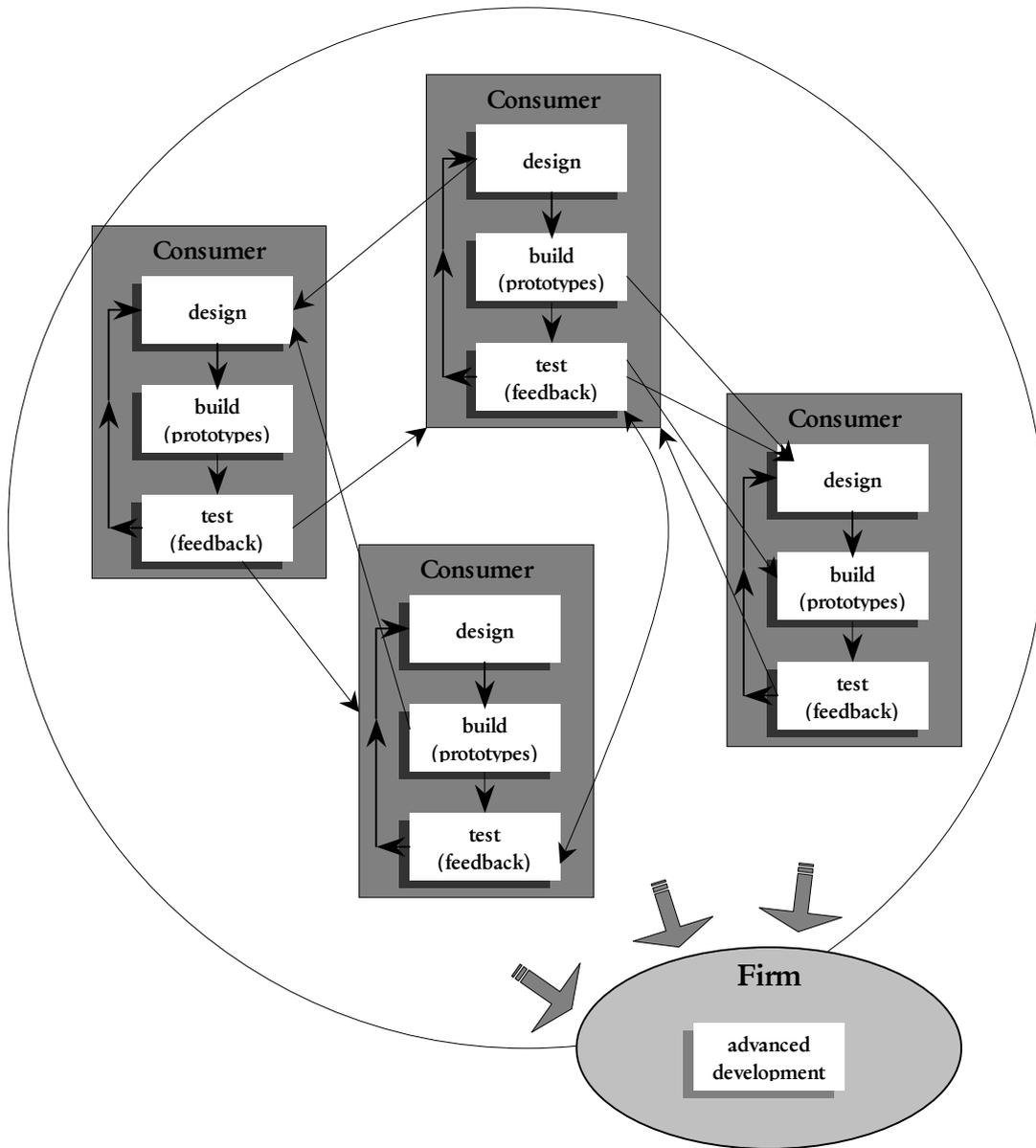
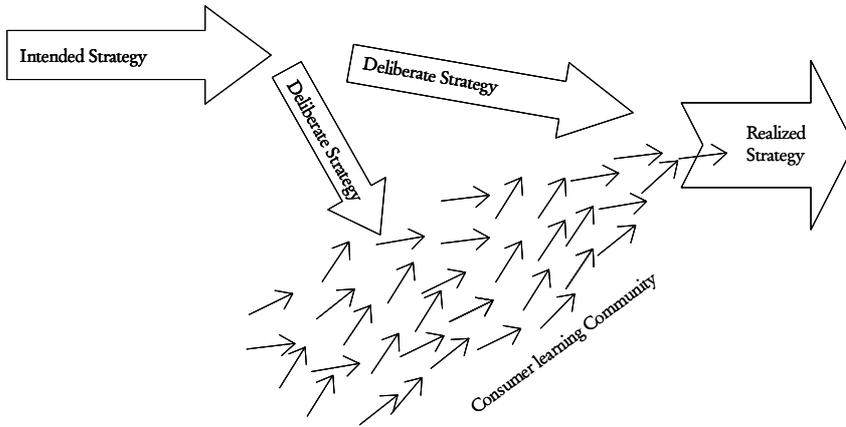


Figure 6
Emerging Strategy with Consumers as Co-Developers



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