
R&D as a Bazaar Economy

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INTRODUCTION

For some little while now, with a mixture of bemusement and concern, I have been watching as two new (well, relatively new) ideas have struggled to get into vogue in Xerox. The first is the claim that there is a fundamental transformation going on in the basis of Western Economic structures (in the Mode of Production no less). Value creation is increasingly centred on the application of intellectual capacities not material and organisational ones. We are witnessing, or so the claim goes, the emergence of a *Knowledge Economy*. The second, intimately connected to the first (at least in some minds) is the notion of Intellectual Property Asset Management (Nonaka, 1991; Takeuchi & Nonaka, 1995). Here the realisation is that since increasingly the primary locale of what gets added in any “value added” process is in the heads of employees and so capable of walking out of the gate at will, such *intellectual capital* must be given just as much management attention (and hence just as much management) as any other vital asset.

The reason I am *both* bemused and concerned is not that I doubt the reality of the changes being picked out (though I do try to be a little less portentous about them). It’s just that from where I find myself scrabbling about on “the glass carpet” of Research and Development (R&D), *there’s always been a knowledge economy*; and *intellectual property asset management is about as good a job description as any for my role*. For me, being encouraged to think about my daily activities as managing intellectual assets and participating in a knowledge economy has all the hallmarks of Mr Jourdain being asked to contemplate the wonder of his speaking prose (and is likely to be just as debilitating as that would have proved).

To my eye, the significant changes are not to do with the form of the innovation production system (that is, from a material to a knowledge basis). Of course R&D is in the knowledge production business. Rather, what seems to be fundamentally different now is what you might think of as *the second order derivative for innovation* (the rate of change of the rate of change) - its cycle time, if you will. Notice I am not talking about invention. Invention has to do with the generation of new ideas and their reduction to practice. Innovation has to do with assaying and realising the commercial (and other) value which such ideas might have in and for some relevant domain. Innovation, then, involves another (and very long) step beyond invention. In the marketplaces within which the outcomes (and I’ll stay as general as that for the moment) of the R&D I manage are deployed, both the pace and the acceleration of innovation are startling; nay terrifying.

Here is a schematic to make what I am saying even more clear:

Shelf Lives of Technologies

Span	Millennia	Centuries	Decades	Years	Months
Technology	wheel	pocket knives	xerography	personal computing	Internet

The first two cases should, I hope, be unproblematic. While it is certainly true that wheel technology has undergone significant changes, the rate of such change has been relatively slow. What, for example, in the past 2000 years has really changed with the wheel (as opposed to the technology of steering) other than the invention of the spoke and the pneumatic tyre?¹ The Swiss Army Knife has changed not at all since it was first invented and productised in the late 19th century (Lewis, 1996). Xerography too has been stable over a reasonable period since its first productisation by Chester Carlson in the 1930s (Mort, 1994). What changes there have been have mostly been refinements and improvements and have not led to fundamental revolutions. The revolutions affecting xerographic products have come from alternative technologies and have taken place *in the marketplace* not in the technology. In that sense, xerography has had a “shelf life” of at least 5 decades. In the PC world by contrast, Moore’s Law has meant that we have had to think in shelf lives of small numbers of years not decades. Processors that were “leading edge” just two years ago are now consigned to the scrapheap as we rush headlong towards the teraflop chip and its mindboggling “zorch”. If that were not enough, the evolving phantasmagoria known as the internet seems to be moving us down an order of magnitude once again. Here as we can see in the speed with which the “browser wars” were fought and won; the emergence and dissemination of Java and similar languages; and the growth, maturation, and decay of “internet businesses”; the unit of change is months not years. Verily, Harold Wilson’s dictum that a week was a long time in politics will soon apply to the web economy.

Now I don’t want to overlay all this. One can very easily get *very very* giddy about the internet and the “opportunities” it holds. In all likelihood, it will turn out to be neither the New Jerusalem nor the South Sea Bubble many are predicting. Nonetheless, something is going on here which is accentuating aspects of innovation in digital technologies. Let me summarise what I think they might be:

¹ In fact this stability has led to the occasional case where social and economic progress has necessitated moving backwards technologically (See Bullitt, 1990).

NO ENTRENCHED POSITIONS

Actually, what I mean is no entrenched position lasts for long. It is a continual scramble to find a position which can be “protected”, an “edge” which can be sustained. As Java, Netscape, Psion, the Pilot and the Nokia Communicator have shown, not even the combination of Compaq, Intel and Microsoft is invulnerable. Though in turn what all of these have also shown is just how ruthless those who hold dominating positions can (and perhaps have to) be to retain their pre-eminence. Running faster is not simply a requirement for success. It is the name of the game.

DONNE’S RULE RULES

Perhaps more than in any other marketplace, here no one can do everything for themselves. Everyone needs partners, alliances (see the previous point), or in that horrible Harvard neologism *co-opetitors*. This is one of the direct consequences of the second derivative. Given the rate of change in the rate of innovation, no one can predict the whole range of skills which will need to be amassed to create and take advantage of the next revolution but one (and thinking about the next but one is what everyone is doing. The game is over already for the next).

PROTECTING THE UNPROTECTABLE

This is possibly the deepest change and certainly the one for which we have been least well prepared. Our standard model is one of defensive assurance through asserting patent protection for key intellectual property. However, more and more the key enabler for the realisation of business value lies not in the distinctiveness of the technology but in the *market connectedness* of the delivery organisation: on its ability, that is, to understand the marketplace, spot the opportunities and move quickly and effectively to assemble the components to cash in on them. It is hard to imagine how to protect market connectedness. Nor, in one sense, would one want to. Being market connected, demonstrating that you are market connected, is one of the signs and signals of the successful. As Zero Mostel memorably advised in *The Producers*: “If you’ve got it, Baby, flaunt it!”.

In sum, as the character of competition in emerging digital marketplaces evolves so our classic model of “fortress R&D” hedged about with patents and Non-Disclosure Agreements is rapidly proving otiose. We are having to be more entrepreneurial, flexible, responsive, willing to tolerate the ambiguity deriving from competing in one sphere and being allies in another. Along with this is emerging a perspective on forms of knowledge, some of which, though they might be intellectual property in the traditional sense, are actually based upon a different conception of how and where competition for knowledge might be organised. The upshot is *not* reduced competition for knowledge; far from it. It is, rather, that the character of the competitive space has to be re-drawn. The manager in R&D has to approach the management of intellectual capital and participation in the knowledge economy in more flexible and perhaps even sophisticated ways than

in the past. A much more subtle view of the relationships in the marketplace is needed as is a different way of defining the market itself. The next two sections take up these suggestions.²

VALUE AND INNOVATION

Here is a set of propositions summarising what I suppose to be the conventional wisdom on innovation and value creation within commercially-driven organisations.³

1. The process of defining, creating, articulating, instantiating and deploying valuable new knowledge is innovation. Innovation takes place along the whole value chain (cf. earlier).
2. The primary metric of value is potential increase in profitable revenue streams.
3. Innovation which is commercially valuable may be technological or processual. Technological followers often gain advantage from process innovations.
4. Business Groups or Business Teams (internal or external) who make offerings in the marketplace are in the first instance the consumers for innovation.
5. For a Xerox Business Group, the value proposition for innovation concerns its contribution to creating or maintaining a sustainable competitive advantage.
6. Value propositions for innovation are realised through market-like mechanisms and structures and assessed in their terms.
7. The only sustainable strategy for innovation producers/suppliers is to engineer a constant expansion of the need for innovation. Assuming the market is zero sum and competing on that basis will ultimately be catastrophic.

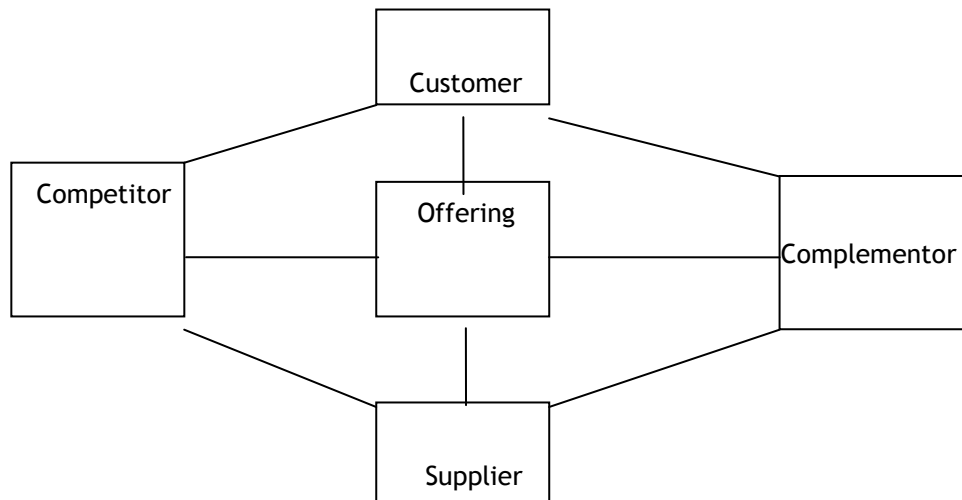
A VALUE NET FOR INNOVATION

One way to set out the relationships in any marketplace is to map the value chain (suppliers/producers/customers) against the competitive space (competitors/complementors). Adam Brandenburger and his colleagues (Brandenburger & Naleboff, 1995) have called this particular device a “value net”. In this way the two main relationships (transactors and competitors) in a market can be drawn out. Schematically, the value net looks like this.

² There are other corollaries of these changes, such as the need to rethink the nature of time in R&D, which cannot detain us here. This latter has severe implications for Corporate strategies such as that promulgated by Boston Consulting Group (Stalk & Hout, 1990) which emphasise time-based competition.

³ It is a moot point how far any R&D group can in this day and age afford not to be commercially driven. However, for the most part I have in mind Corporate R&D functions and contract research organisations.

Schematic Value Net



What the value net representation brings to the fore is the potential alternative or *side relationships* along edges other than those defined by competition and the value chain. Exploiting these, or so it is said, offers the opportunity to re-shape a market.

The Innovation Value Net

It seems trivially easy to identify the players in the complete innovation value chain:

scientific community → R&D → development → manufacturing → marketing → sales & support
→ end-customer

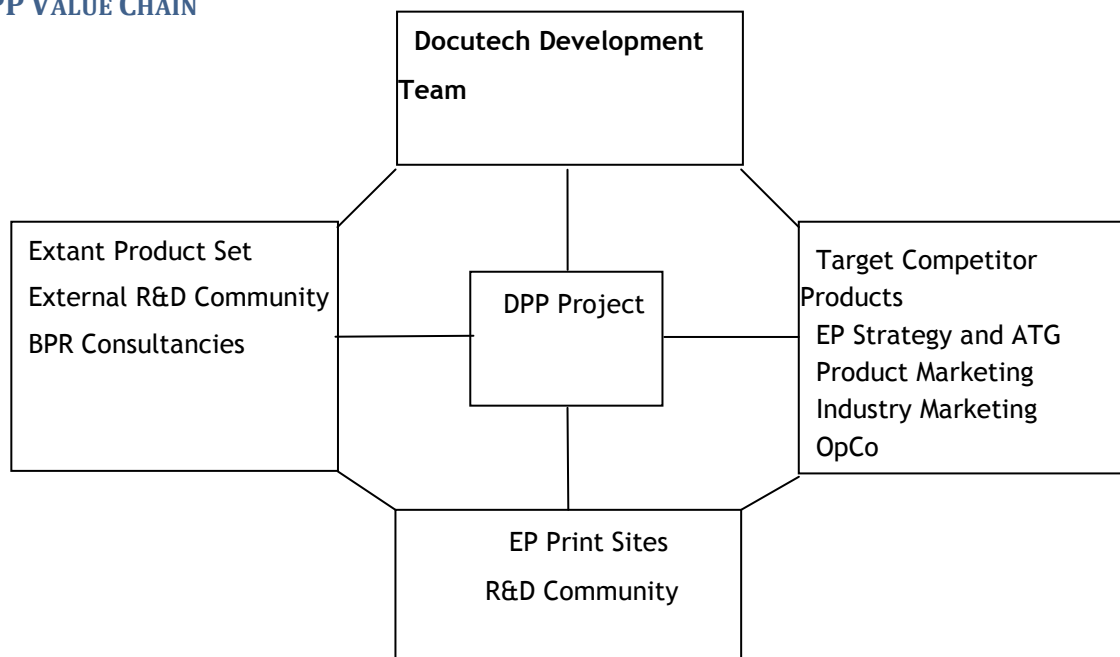
Of course, from the R&D perspective, the first instance customers are the development groups who take the prototypes, designs, specifications and other deliverables created by the research teams.

The competitive space is not quite as easy to map. Who are the competitors and complementors for innovation? Competitors are defined by those whose presence in the market causes a reduction in your capacity to sell your product. From the R&D perspective these could well be the proponents of the extant product set, outsourced contract R&D, consultancies, supplier R&D. Complementors are defined as those players whose presence in the market enhance the attractiveness of your own product or whose participation in the market make your own more successful. For R&D, these are likely to be the marketing and strategy groups (i.e. the big picture guys), the Corporate Office (the long term vision guys), development teams and, of course “marketplace competitors”.

Interestingly, external R&D groups (even Universities!) could be complementors if to deploy their products requires an internal R&D operation.⁴

Let me put some flesh on these bones and construct a value net for a specific R&D project within my Lab.⁵ This project is concerned with identifying the range of services (*always* (wrongly) called “value added services”) which might be made available through the networking of our high-end reprographics engines. I won’t go into exactly what kind of network services we have in mind (for obvious reasons), though I doubt if there is anything world shattering in our plans. The project involves a co-operation between ourselves (RXRCC), the Operating Company who “owns the customer” (RXUK) and the customer (Establishment Printers). We have been studying the current work and business processes at Establishment Printers and identifying the opportunities and risks which networking their 18 Docutechs (a Xerox product which produces up to 120 pages per minute and sells at about £1m a time) might bring. Together with the Product Development Group, we have also been defining the requirements for network services of the kind we have in mind. From where we sit, the value net looks something like this.

DPP VALUE CHAIN



Of course, from the Development and Business Teams perspective, things can look somewhat different.

⁴ There is a line of reasoning to be pursued here that seems to put a limit on the extent to which internal R&D can be outsourced.

⁵ This work has been summarised in numerous places. See Button & Sharrock (1997).

Looking at the value net for innovation, it is clear that just as in any marketplace R&D has to be able to answer two questions:

1. What is the value proposition being offered at that point on the value chain - i.e. what's the value add of this particular innovation offering?
2. How can competitors be turned into complementors?

In the context of a rate of innovation in digital technologies such as that described earlier, it seems clear to me that it is the latter which is the crucial concern. What is emerging in the R&D marketplace is a set of market structures which seem to have been designed to facilitate complementary relations rather than competitive ones. Such structures are amazingly correlated with those described by anthropologists as definitive of bazaars (Geertz, 1992).

R&D AS A BAZAAR ECONOMY

There are many different kinds of markets and market structures. This is an important point to recognise. Saying there are many different kinds of markets is not the same as saying there are many different versions of “the market” (or “perfect competition” as it is usually defined in Economic theory). The stockmarket or the money market may well approximate quite closely to the tenets of the perfect market model. But that should not make them paradigm marketplaces.

The reason for this is relatively easy to grasp. The “perfect market” or “free market” is predicated on four axioms:

1. A multitude of buyers and sellers trade in the market
2. Any market actor can trade in any commodity
3. There are no impediments to moving between commodities. This is the so-called “frictionless” aspect.
4. There is perfect information in the marketplace. Information is uniformly distributed and exhaustive.

Perfect markets are also temporally short sighted. But this is not seen as a significant assumption (wrongly in my view).

Financial markets are reasonable approximations to the model described by these axioms. To accommodate almost any other “market”, one or more of the axioms has to be relaxed or re-interpreted. What has to be adjusted to enable us to describe the operation of a bazaar? To begin with, of course, everyone in a bazaar (bazzaris) is a rational economic calculator. They are looking for maximum utility and profit though they usually do so over the course of a number of connected transactions—a viewpoint which marks them off from perfectly competitive markets. Second, of course, the price settled in the marketplace is a function of supply and demand. But this function is very much a fuzzy one. To begin with, it is temporally lagged and temporally projected. It takes time to respond to events and often such responses are geared to signals and signs more than to the

events themselves. Then there are factor costs. As with all markets, factor costs do reflect factor inputs and their proportionalities. Alongside these, there are the opportunity costs surrounding the relative inflexibilities of resource which are built into its structures. In bazaar markets, traders can only with difficulty shift between commodities to trade in. It takes time, effort and resource to set up the chains of supply and distribution required to participate in the market for any individual commodity. Bazaars are definitely *frictional markets*.

What all of these add up to is an overriding concern with *information* and with managing uncertainty about *information flows* rather than utility flows (the focus of standard theories of “the market”). It is information about utility values rather than mechanisms for its distribution which defines the bazaar. And, unlike in the standard case, in the bazaar information is always poor, scarce and mal-distributed. The mechanisms by which information circulates are chronically inefficient, but turn out to be all the more functional for that. The point is that those who trade in bazaars know these things to be the case. They form the background, the context, the frame of reference against which the bazaar’s economic institutions are understood. As Clifford Geertz remarks, the institutions of the bazaar constitute an actor level response to system level deficiencies (Geertz, 1992).

The arts of the bazaar are those of information acquisition and accumulation. Bazaaris do not exercise options. They are trying to discover what their options are. In the bazaar, information is all. And everyone knows it.

The bazaar, then, is characterised by pervasive uncertainty and search for knowledge. Who are the buyers? Who are the sellers? What is the price? What is the quality? Can the goods be supplied? And when? Faced with these uncertainties,⁶ *clientelization* and *bargaining* are rational responses which reduce and manage the search space. Bargaining with clients is how the bazaaris carry on. What clientelisation achieves, of course, is a structuring of the potential search space. Transactors are pre-defined as those with whom one trades and those with whom one doesn’t. It also contributes to a second dimension of the search; not just with whom to trade but where to trade since clientelisation allows for the extension of the division of labour and its associated specialisation.

Bargaining is the modality of information transfer. In bazaars, bargaining is multidimensional and intensive. The latter refers to the practice not of collecting alternate bids in the market but exploring in depth the constraints on a particular offer. In addition, all aspects of the transaction are open to bargaining: the price, the quality, the credit arrangements, delivery times, and so forth.

⁶ It is important not to see these as “problems to be resolved” or “defects”. They are characteristics, that’s all.

THE DIGITAL R&D BAZAAR

The twin aspects of clientelisation and bargaining are at the heart of the increasing use of research contracting and research consortia in the digital innovation marketplace. Contracting ties the value chain together over time with all the parties being each other's clients in some sense. And while the apparent formality of the contracting process might seem to contrast with the relative informality of the bazaar, the intensity, extensiveness, and personalised characteristics of such negotiation make them very bazaar like indeed. The pace of innovation means that what the contracts defined is constantly under review and constantly being re-negotiated. Given the potential for instability generated by the technological forces, the economic structures (contracts and clientelisation) impose a measure of predictability. They make it possible, for example, for an R&D manager such as myself to invest in lines of research for which no marketplace opportunity yet exists. I can do so because I "know" that my current customers will in all likelihood be my future customers. I know and trust they will buy from me. They know and trust I will be there to supply them.

How does this help with the competition in innovation issue? If we go to the Document Production Printing (DPP) example, here we were faced with two possible internal competitors- product marketing and the current product set both of whom could well have been committed to not adding new services to their product. If they were likely to consider this option, they might have chosen to hire a Consultancy to provide the analysis required. Clearly, though, print industry marketing were a complementor since proposing a new set of services to be initiated in their industry was something they were looking for. Similarly, Establishment Printer's own internal development and strategy groups were complementors since if we were able to demonstrate the viability and business value of networking, then there were more real opportunities for Establishment Printers to steal a march on its competitors. Their analysis of their future began to depend on our carrying out of our project. Access to Establishment Printers mean we could propose an ongoing set of transactions around the findings of this project thus converting the Development Team and others from a one off customer to a client. Positioning the DPP project in this way within its marketplace transformed product marketing and the Development Team into complementors. They now began to talk in terms of "mid-life kickers" and the opportunities which our project might give them to further enhance their product with technologies drawn from elsewhere within and outside Xerox. Such technologies, of course, are or were potential competitors to the ones we will be proposing. Thus far we have succeeded in turning them into complementors. It remains to be seen when the Development Team do their value engineering whether they stay that way.

Thus far, I have been using the parallel between R&D and bazaars as a somewhat tendentious image. However, I think it is more than this. If we look closely at the constraints on information to be seen within any bazaar, we will soon conclude that they hold for R&D too. They are constraints on: the quality and quantity of information; the distribution of information; and the mechanisms

for information flow. Indeed, clientelisation of innovation is a strong and very effective response to them.

CONCLUSION

The innovation marketplace is a bazaar. It operates increasingly on principles which work for bazaars. This tendency will only increase as the rate of change of digital technology picks up. This is because such increases in the second order derivative for innovation is inherently destabilising in the sense that it increases uncertainty, And it is uncertainty that the social institutions which characterise bazaars are designed to counterbalance. R&D managers (and their contracting partners) will increasingly adopt the roles of bazaaris with clientelisation and bargaining as the *modus operandi*. In so doing, not only are the elements of a temporally and organisationally extended value chain tied together but potential competitors are transformed into complementors.

REFERENCES

- Bullitt, R. *The Camel and the Wheel*. Columbia University Press, 1990
- Brandenburger, A. & Naleboff, B. *The Right Game: User Game Theory to Shape Strategy*. Harvard Business Review, July-Aug, 1995, pp. 57-71.
- Button, G. & Sharrock, W. *The Production of Order and the Order of Production*. J. Hughes et al. (eds.), Proceedings of the Fifth European Conference on Computer Supported Cooperative Work, 1997, Kluwer Academic Publishers, pp 1-16.
- Geertz, C. *The Bazaar Economy*. In: M. Granovetter and R. Swedborg. *The Sociology of Economic Life*. Boulder Co., The Westview Press, 1992.
- Lewis, T. *Software Architectures: Divine plan or digital Darwinism*. Computer, Vol. 29, No. 8, August 1996, pp 13-15.
- Mort, J. *Xerography: a study in innovation and competitiveness*. Physics Today, April 1994, pp 32-8.
- Nonaka, I. *The Knowledge Creating Company*. Harvard Business Review, November-December 1991, pp 960-104.
- Stalk, G. & Hout, T. *Competing Against Time*. New York: The Free Press, 1990.
- Takeuchi, H. & Nonaka, I. *The Knowledge-Creating Company*. Oxford UK: Oxford University Press, 1995.