Navigating the Innovation Matrix: *An Approach to Design-led Innovation*

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In an era where companies can no longer rely on technological breakthroughs and incremental product development, innovation is high on management agendas. At the same time, the scope of innovation has increased in complexity, where products, services, user needs and technologies need to be integrated while bringing many different stakeholders together. Nevertheless, the process of innovation is often seen as being very linear, with research results, new technologies or user insights funneled via advanced development and new business processes into the market. The present case study, however, sets forth an alternative view that sees innovation as a network of options. We propose that there are different ways of capitalizing on imaginative ideas, and that it is necessary to explore the best way forward on a case-by-case basis rather than by trying to impose a business straitjacket too early. To illustrate the potential of this view, an *Innovation Matrix* has been developed. Finding the best way through the non-linear matrix of options is a key factor in moving imaginative ideas effectively to the market. There is more than one path one can follow to breathe life into delicate ideas, and the design discipline can play a central role in facilitating this.

Keywords – Innovation, Matrix-based Approach, Design for Research, Business Value.

Relevance to Design Practice – This paper presents a matrix-based approach to innovation which offers more possibilities for generating innovation and for managing multiple options than the traditional linear approach does. Insights into how design can contribute to this process, by both developing imaginative ideas and by presenting them in different ways, are also provided.

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Introduction

It is an inescapable fact that the success rate for bringing new innovation ideas to the market is pitifully low. This was clearly set forth in two articles published in Business Week in 2005. The first (Nussbaum, Berner, & Brady, 2005) stated that "companies in the US, Europe and Japan were struggling with innovation" (p. 72). Despite spending huge sums on research and development, most corporations had dismally low levels of innovation productivity. The article continued by saying, "the brutal truth was that up to 96% of all new projects fail to meet the targets for return on investment" (p. 72).

In December of the same year, an article by Christopher Farrell (2005) entitled "Mining the Vein of Great Ideas" examined if there was a way for investors to spot early innovation opportunities that had a higher chance of success. The point was made that:

> There is no simple correlation between increased research and development spending and higher stock prices. In fact, stepped-up research & development often depresses near-term earnings because those costs must be expensed now while the payoff of new innovative products could be years away. Besides, much research & development spending produces nothing that customers want. (p. 110)

This situation may have its roots in the fact that most of the conventional wisdom on innovation theory is based around the idea of a linear progression from research to development (Figure 1).

This linear innovation process has been seen in terms of a funnel model in which many different and disparate initial ideas are gradually whittled down either inside or, increasingly, outside the company – according to the open innovation paradigm of Chesbrough (2003) – until eventually a small number of the most feasible concepts are left. These can then be developed and matched with the business case that will give them the greatest chance of becoming profitable propositions. At each stage of this model there is a go/no-go decision taken based on criteria that are considered to be important to the future success of the idea.

Figure 1 also shows that business models are being considered ever earlier in this process. Many see this as a necessary selection mechanism – business models acting as stage gates – as it increases the possibility of new ideas maturing into products or services the market will embrace. The reality as illustrated by Business Week, however, is the exact opposite.

At Philips Design, it is believed that forcing business priorities too early onto innovations confuses the issue rather than

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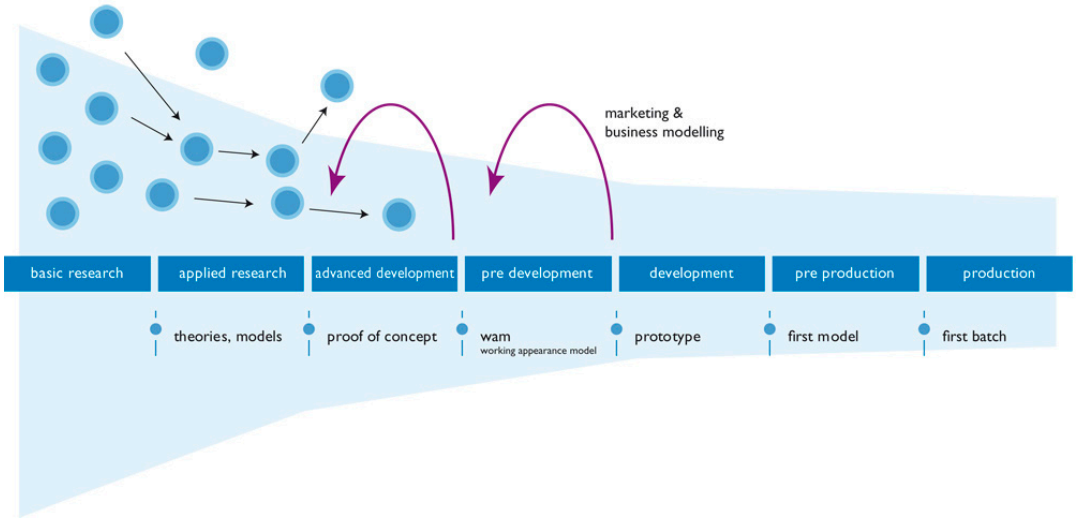

Figure 1. The innovation funnel.

clarifies it. Very often, the route to market success is markedly different than the one described in this linear model because ideas may need to divert from the conventional path before they find their true application. This idea also conflicts with the funnel model described above as it essentially proposes that we don't necessarily need more ideas, just better ones. Further, the best way to facilitate innovation with this approach is to have better input and better feedback, which often leads the innovation process in many and decidedly non-linear directions. How this approach can be best utilized can be realized through a look at some of the successes at Philips Design.

Design Research at Philips

There is a long history of design research and innovation at Philips Design. Visionary projects were already taking place at Philips in some shape or form almost a half a century ago. Beginning with Philips' Le Poème Èlectronique, which was an exploration of the design of the future presented at the Brussels World Exhibition of 1958 and designed by Le Corbusier, Iannis Xenakis and Edgard Varèse, there has been a succession of explorations into the medium and long-term future. Carrying out this type of work has allowed Philips to develop knowledge and competence on three different levels which combine to help create the matrix currently used. Before describing them, however, it is important to consider the difference between design and design research, which is a difference that shapes the foundation of research at Philips.

In general, designers are trained to solve design-related problems, while researchers are trained to develop generally applicable principles. There is quite a difference between the two. The former is about avoiding mistakes, whereas the latter often involves making mistakes that enable fast learning. Philips follows the design research models proposed at the Royal College of Art conference, Design/Research, held in May 1994 and chaired by Sir Christopher Frayling. Three specific forms within design and art research were identified and used as a framework for further understanding the way the practices of design and research can be viewed in respect of each other. Namely, they were research *into*, research *through*, and research *for* art and design.

Design research is currently regarded by the design industry as research that designers require in order to do their jobs better (e.g. specific people research, cultural trends). At Philips, this is called *Research for Design*. This is important for designers at Philips where the aim is to build and sustain a leadership position on subjects relevant to the design profession. *Research into Design* is regarded at Philips to include researching new methodologies and design languages. This goes some way towards shaping the future of the design profession. What makes design research unique, though, is the role of design as a research tool itself, known at Philips as *Research through Design*. After all, one can come up with a novel idea, but it can only be properly validated and tested in an environment where it could eventually be applied. Developing these new application areas is the most important aspect for Philips as a whole because it enables both the proposal of timely business options with high potential value, as well as the building of strategic partnerships with the Philips product divisions.

Over the last several years, Philips has examined how *Research though Design* can better contribute to innovation. Through this, Philips' designers have realized that innovation often has a higher rate of success if it is considered as a network

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of options seen within a trajectory of three horizons of growth which can be explored to find the best route to market. This means that transferring innovation directly into new business activities is not necessarily the best way forward, as there are other ways to capitalize on imaginative ideas. Given that sustainable innovation is high on today's industrial agenda, this is particularly topical.

Three Horizons of Growth & Gartner Hype Cycle

In order to better understand the innovation territory, it is helpful to refer to a model described in *The Alchemy of Growth* (Baghai, Coley, & White,, 1999). This model is based on the claim that companies have to manage these three different horizons simultaneously in order to be able to innovate effectively. The three horizons are:

1. Horizon 3: Creating viable options
2. Horizon 2: Developing new business
3. Horizon 1: Defending and extending the company's core business

These three horizons can be shown in relation to the Gartner Hype Cycle (Linden & Fenn, n.d.) which describes the path new technologies take as they are hopefully established in the market (Figure 2). This curve identifies five distinct phases: the technology trigger, inflated expectations, disillusionment, enlightenment, and productivity. In this case study, this curve is interpreted to mean that often the real application of a technology is not in the area in which it was initially envisioned. After the initial hype (inflated expectations) there follows a period of disappointment during which there is less interest in the technology. This dip, however, indicates that the true application for the technology needs to be found, after which comes a period of sustained growth.

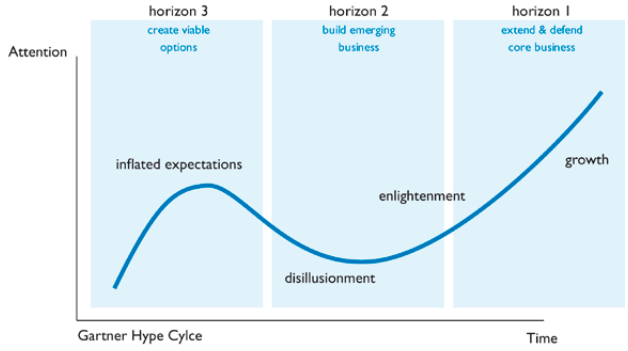

Figure 2. The Three Horizons of Growth and the Gartner Hype Cycle.

This likely change of context is confirmed by numerous examples, the most obvious probably being the Internet. The role it now plays in our lives could never have been envisioned when it was originally developed by the American military. As will follow, this progression can also be seen through many examples of the innovation process at Philips.

Design Case: The Birth of Ambient Experience

To illustrate the idea of design led innovation, it is worth looking at the path Philips took in first developing the visions for experience design, to the creation of the design experiment Nebula – a part of the design research program called Noah's Ark – to the ultimate Ambient Experience that we see today in the healthcare industry. Philips Design created the first ambient experience propositions for healthcare in 2003 together with the Business Unit Magnetic Resonance and the North American Strategic Marketing group. The path to this point can be held up as an example of design-led innovation.

Noah's Ark (2000) was Philips Design's pioneering design research program carried out as a first step towards establishing an ambient experience design discipline within Philips. The purpose of the project was not to create pre-defined experiences for people, but to explore natural and intuitive ways of influencing the environment through multi-sensory stimuli to create atmospheres that encourage and enhance rest, reflection, conversation, intimacy, imagination and play. The teams explored three general areas: the sensorial, the virtual/physical, and the spatial/environmental. The teams' objectives were to research, design and produce something that would advance Philips' knowledge and understanding of experience design, as well as enhance their ability to communicate it. This was also Philips' first step in applying technologies to create today's Ambient Experience for Healthcare solutions.

Horizon 3: Exploratory Project – Nebula

Nebula, one the design experiments in the Noah's Ark Project, produced a system using projected images, active and conductive bed linens, a camera and textual content coupled to the unpredictability of human behavior, and a simple alarm clock to enhance the sleeping experience (Figure 3). It provided an intuitive and natural way of physically participating in a virtual experience through simple body movements and gestures. The experiment delivered an instance of how, when using an experience design approach to design new solutions, the mundane aspects of life might be much more richly experienced.

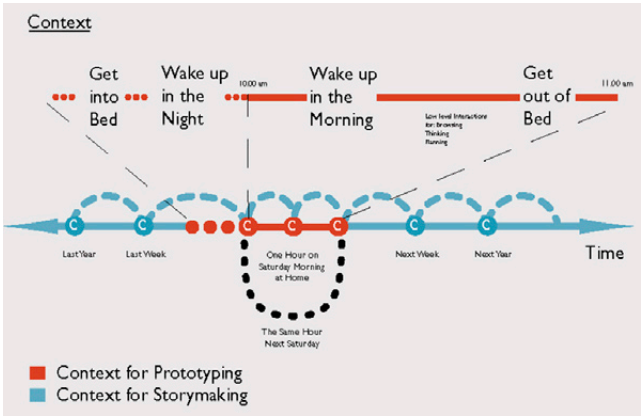

Figure 3. Nebula, the experience cycle.

With the creation of Nebula, the innovation process can be seen to be in Horizon 3 as it provided fundamentally new opportunities for the use of new and emerging technologies, new everyday experiences, as well as the possibility to build a new market through which to present these ideas. Before it is shown how this idea progressed into the next stage of development, it may help to understand what Nebula actually produced.

The purpose of Nebula was to create an overall enhanced sleep experience. It consists of a ceiling projector linked via the Internet to a database of content (Figure 4). Once you have selected the content for projection, you can manipulate it simply by adjusting your sleeping positions and interacting with your partner while in bed. For example, one algorithm in the system translates certain body positions and movements into moving imagery and text. Since the dynamics between individuals are random and unpredictable, the flow of content created by you and your partner will be unique and specific to you. In general, the ceiling projection becomes livelier as you become more active (Figure 5).

Figure 4. Nebula – A virtual/physical experience for bedtime.

Figure 5. Nebula – Movements dictating projected images.

Pebbles

To select content, the user places a smart 'pebble' into the bedside pocket (Figure 6). The pebbles are actually small RFID tags embedded in plastic. Each pebble is linked to a piece of content which can be selected and then placed in the pocket by the bed. The sensors recognize the tag and instruct the computer to link the image to the projector. For example, a 'cloud' pebble produces content related to clouds and the sky, while a 'poem' pebble produces content related to poetry and rhymes. The content also changes according to the time of day and the season. For example, a cloud pebble will trigger a dark sky when viewed at night, but produces a bright, blue sky during the day.

Figure 6. Nebula – Pebbles.

Alarm and Time

Once the alarm clock is set, the system projects two dots onto opposite sides of the ceiling. During the night, the distance between the dots diminishes, visually illustrating the time remaining before the alarm goes off. If you wake up in the night, you can easily gauge time left till morning from the distance left between the two. When the dots collide, sound and images are combined to create an appropriate waking experience.

Message and Drawings

One can also incorporate messages and drawings into the projections (Figure 7). Simply write a note or sketch something on a piece of paper and place it underneath the alarm clock. When the alarm goes off, a snapshot of the note or illustration will be projected.

Figure 7. Nebula – Time & Drawings.

Games

Pebbles can also contain games, such as ping-pong. These are only revealed when the users have assumed a particular combination of

sleeping positions. Once the positions have been discovered and the game is revealed, you can activate the game at any time by holding the top section of the duvet cover. Pulling the duvet to the left or right controls the left and right movements in the game.

From Horizon 3 to Horizon 2

Many of the ideas and technologies associated with our Nebula exploratory project – which looked at customizing the experience of waking up by projecting images and messages onto the ceiling – are now used in medical examination rooms. The current Philips Ambient Experience Design uses projection, as well as a number of other technologies, to customize the immediate environment in healthcare facilities for people who have to undergo examinations such as CT or MR scans.

The first interactive demonstration of an innovative experience design solution was unveiled at the Radiological Society of North America's exhibition in Chicago, 2003. Known as the MR Ambient Experience, as with the Nebula experiment, the approach extended far beyond the design of a product and led to the creation of an entire environment. Jeroen Raijmakers, Global Design Director Healthcare at Philips Design, was quoted as saying that:

> There is only so much you can do during product design. If you want to make the experience even more complete, then you also have to design the context in which it is experienced. We started with research into the personal experiences that patients and professionals in a radiology environment have. We called it ambient experience design because it embedded light, multimedia and interaction with users in an architectural context. We took a close look at the phases patients have to go through during a radiological exam, from expectation to memory. Needs of patients and professionals during waiting, preparation and the actual scanning procedure were identified and translated into solutions. We came to the radical conclusion: the whole radiology department should be redesigned. ("Designing the experience," 2004, p. 13)

By focussing on the design of the experience and coming close to installing an entire architectural solution which was only revealed over time as people interacted with both it and other people, Philips had to change the way it designs, what it designed, and in-turn how to sell or transfer the ideas created. It is not an easy feat to sell a design idea to clients and support them in the development and delivery of these ideas. This period of selling or transfer of the idea might be called the time of disillusionment or Horizon 2. Not only did Philips have to change the way they worked, they also had to support the clients in the ways in which they worked. Using the exhibition platform as a means to position the 'whole design idea' concept was quite straight forward, and many of Philips' client contacts accepted the proposition relatively easily. The challenge really manifested itself when they, in turn, had to change the way their organization operated. They had to change from being a company supplying boxes to hospitals with its own manufacturing, logistic, installation and service agreement infrastructures into being an organization committed to working in partnership with the construction industry, architects, social cultural researchers, human behavioural psychologists, and all other disciplines required to conceive of a whole hospital environment. This cooperation was needed in order to co-design, sell, install and service the ultimately produced complex, intelligent environments.

In summary, Figure 8 shows Nebula, where the competence and intellectual property (e.g. patents) was developed, and Ambient Experience, where the original idea is now being applied in a very different context than originally imagined, in relation to the three horizons. This positive, but not necessarily anticipated outcome, was a clear indication of the possibilities of a non-linear progression of design.

Clayton Christensen's (1997) *Innovator's Dilemma* describes the familiar scenario whereby products that have established themselves on the market attempt to maintain their position by dint of a succession of new features. The trick in the present case was to find a target group (e.g. hospitals that want to improve the patient experience) that embraced the new proposition, and then to eventually help it progress into mainstream acceptance. The process of starting again is known as transformational or disruptive innovation, and it is a further indication that the path to market success is not necessarily linear. The success of the project

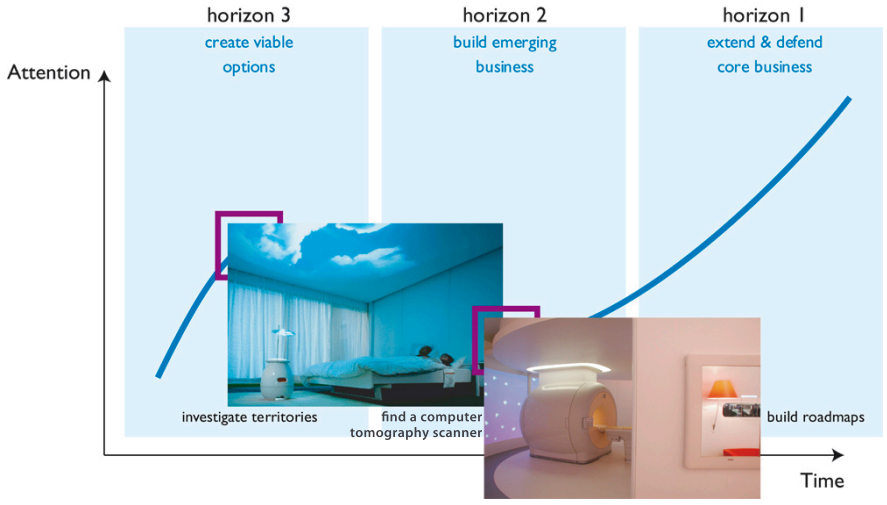

Figure 8. The move from Nebula to Ambient Experience.

strengthened Philips' adherence to the idea not to force business cases too early and to find a way of managing the plethora of ideas without losing track of them as they weave their way through the different routes towards the market.

The Innovation Matrix

The three horizons model emphasizes that different competencies, capabilities and personal profiles are required for each phase. Another important point is the notion that forcing a business case in a linear way onto an emerging technology in Horizon 3 will limit its potential because it denies it the chance to find its true place in the market. Horizon 3 is not about finding out how emerging ideas will be applied; it is about investigating territories and making sure that you claim, in a generic way, the space surrounding the idea. Horizon 2 is much more suitable for discovering the most appropriate application.

This idea somewhat flies in the face of current business wisdom that generally suggests marketing and business models should be implemented as early as possible. Rather than increasing the chances that innovations become mature and viable technologies, implementing these models too early can actually hinder progress. There are many different models that describe the path from innovation to market via basic research, (pre-) development and then product launch. What is required is a more non-linear path between innovation and commercial viability.

An interesting and popular notion is the one described by Lanning and Michaels (1988) where they made a case for the customer, not the competition, as key to a company's success. Instead of positioning research at the start of a linear process that proceeds through the horizons with the goal of bringing imagination to market, we propose that the same mechanism of choosing value, providing value and communicating value – as described by Lanning and Michaels – can be superimposed on the three horizons model to form the *Innovation Matrix* (Figure 9). Doing so shows that there is more than one way of capitalizing on opportunities in Horizon 3. What this matrix illustrates more than anything else is that there are a number of interesting and potentially effective new ways of capitalizing on innovations that arise from the *identifying value* matrix square in Horizon 3, which can be regarded as the point from which the whole process begins.

The conventional linear path from Horizon 3 to Horizon 1 roughly corresponds with the middle row in the matrix. Value is initially developed through the research hypothesis, what we call the *innovation debate* (probes). It then passes into a phase of *collaborative innovation*, where the focus is on working together with strategic partners to develop opportunities for short-term growth. After this, the technology then moves into the *incremental innovation* phase, where new features are gradually added to improve the performance of the existing product.

Every square of the Innovation Matrix can play a vital role in bringing new technology to the market. The path the technology takes to getting there is different each time. What follows is an outline a few of the key points in the matrix.

Futures, Foresight, and Socio Cultural Trends (Horizon 3, Bottom Square)

Identifying value in Horizon 3 focuses on futures and foresight, which involves identifying socio-cultural trends and narratives to identify emerging values and needs as the basis for innovation towards a better future quality of life. To illustrate:

> Thinking about the future we must have insight both on the longer term possibilities and the realities of today. Quantitative data give way to more creative and qualitative approaches that feed the creative and imaginative process. The combination of creative and analytical methods, of design-driven and research-driven approaches within Philips Design, enriches our knowledge and understanding. (Green, 2007, p. 131)

Outcomes of this research range from scenarios and narratives for Horizon 3, which serve as input for the experience prototypes (probes), to ethnographic insights used for Personas (described in the next section) for Horizon 2.

Debate through Probes (Horizon 3, Middle Square)

The middle matrix square in Horizon 3, *innovation debate*, belongs to the traditional area of developing value. Here, Philips has further developed the idea of experience prototypes like Nebula into what we call design probes. Building on the notion of probes as developed by McLuhan (2003), the expanded concept

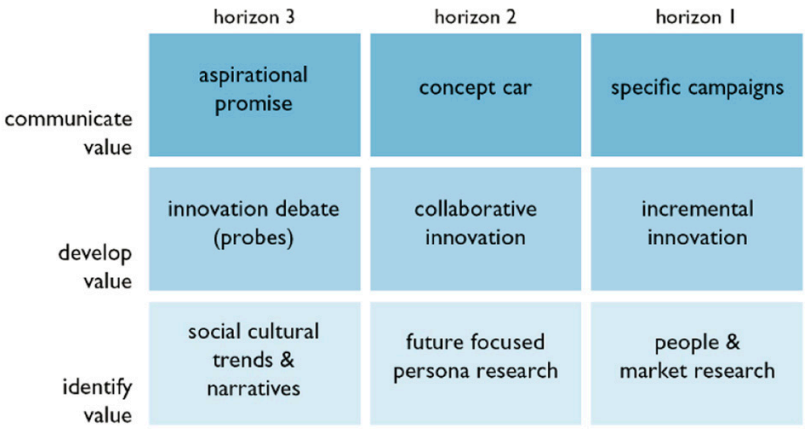

Figure 9. The innovation matrix.

of cultural probes (Gaver, Dunne, & Pacenti, 1999) was taken a step further by providing experience prototypes as probes. The probes are designed to help explore new territories, develop creative insights and to determine whether there is anything to be gained by protecting intellectual property in these territories.

The intention of the probing is to start a discussion on specific territories. An example is the work Philips Design carried out in 2005 with the Helen Hamlyn Research Centre at the Royal College of Art, where prototyped linked appliances – that together constituted a digital ecology – were given to selected users without a specific design application in mind (Figure 10). The appliances represented the content through the way they moved or responded. For example, the user determined the movement and what aspects of the content they refer to, like the more it rains the longer the sticks, or the stronger the wind the more they wave in the air.

The aim was to explore the relationship that can emerge between a user and an object capable of expressing dynamic content by showing movement. To achieve this, the research targeted technically creative individuals with a passion for a particular domestic hobby such as robot building, music or animation. Each person was involved in developing the prototypes by adapting the objects to create their own desired choreography of movement.

The Creative Consortia: Linking 'User Input' to Technology (Horizon 2)

In Horizon 2, we have recognized that although having the right user input is important, it is also crucial to link it to technology in order to develop the value which is identified. It is not enough just to have technology on a roadmap because if nobody is actually working on the technology it will get you nowhere. You have to have proper experimentation and interaction between design and technology to make sure that the products and services being developed will be able to reach the market in a foreseeable time frame.

To this end, Philips has developed a process called TO:DO:SO. This process is particularly effective because it aligns Technology Objectives (TO), Design Objectives (DO) and Strategic Marketing Objectives (SO) already existent in the respective parts of Philips, and is therefore also a way of internal alliance building. Figure 11 illustrates the TO and DO relationship. The SO was added at the next stage of the development of this innovation process.

The process produces one or more experience prototypes which are built on user insights and are created using actual or producible technology. The TO:DO:SO methodology starts by bringing together the disparate objectives of the participants, and by defining a common scope for the application areas among the technology partners. The next step is to carry out user research in the appropriate area, followed by defining the experience concepts based on the technology the partners can deliver. These concepts are transformed into the experience prototypes and user tested.

Core Business (Horizon 1)

The activities of Horizon 1 are the core business for a design organization and is already well-explored territory and therefore beyond the scope of this paper. One should note, however, that ideas from this horizon can also flow to the left of the matrix.

Figure 10. Examples of design probes – using dynamic objects to express digital content.

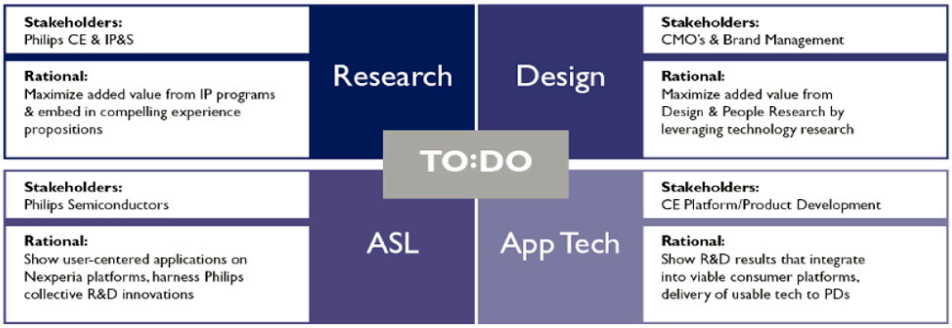

Figure 11. The TO:DO alliance relationships.

A Closer Look at TO:DO:SO (Horizon 2)

How the Innovation Matrix, and in particular the boxes of the matrix for Horizon 2, have been utilized by Philips can be understood by examining their TO:DO:SO approach to innovation. This approach combines consumer trends with key technology innovations to enable the company to stay competitive with its technology, application and product developments. It has enabled a free flow of information across the company and helped facilitate a shared language in the form of a tangible articulation of new digital products that is in line with technology research roadmaps and digital product platform development. Most notably, it is based on consumer insights.

The Rationale

The TO:DO:SO way of working was initiated in 2004 through a long-term collaboration involving 11 partners from Philips Design, Philips Research, Philips Applied Technologies and Semiconductors Advanced System Labs. These partners work together on a shared set of objectives aimed at proposing and demonstrating longer-term applications for Philips' businesses. By working together, they have been able to combine qualitative user insights, technologies and user-experience design to create a timely and coherent set of future propositions that correspond with existing development objectives.

This approach puts the end user in a central position in the innovation process. By incorporating end-user insights from the start, it leads to solutions that both make sense to people's lives and leverage Philips' technology assets. Ultimately, this will help Philips' businesses deliver on the *Sense and Simplicity* brand promise and further the company's competitive position in the emerging connected-solutions market. The rationale for forming this collaboration is three-fold:

1. Using end-user insights and focusing on user experience can steer technology-based innovations, maximizing the chances that they will deliver on the Philips *Sense and Simplicity* brand promise.
2. Focusing on synergies in related design and technology developments will maximize consistency in innovation by
3. Jointly exploring new territories will create room for potential new business opportunities and the generation of a portfolio of intellectual property rights (IPR).

The Creative Process

Any creative process that sets out to synergize the efforts of multiple stakeholders requires a clear structure and powerful creative tools. Philips Design has made the TO:DO:SO approach effective in practice by introducing a sequence of three core tools – Personas, Experience Targets and Slice of Life Experience Prototypes – to facilitate collaboration, idea sharing and cross-fertilization.

Personas: Because it is difficult to predict how technology is used in daily life, the involvement of user insights from the beginning of the innovation process is crucial in the development of solutions that make sense. Philips Design has developed a unique approach (Rameckers & Un, 2004) to embedding user insights by using Personas (Cooper, 1999). Personas are fictional characters based on real-life data (in-depth interviews, observations and home visits) and people research (co-research and socio-cultural trends research). The richness of information they bring is useful throughout the innovation process for direction setting, solution creation and concept testing. For the Intuitive Connected Home II prototype (Philips Design, 2005) discussed later, three Personas were created from interviews during field studies in Europe and used to provide qualitative consumer insights and identify key user needs and experience challenges.

Experience Targets: The second innovation tool provided by Philips Design, Experience Targets, signals a shift away from wrapping a consumer experience around a predefined solution. Instead, the focus is on building relevant solutions around key end-user experiences. The TO:DO:SO partners jointly defined a spectrum of early sketches of use cases relevant to their development roadmaps and to the Philips businesses. Qualitative end-users insights, captured in the form of Personas, were then set in the context of technological developments and socio-cultural trends to create an overall picture of potentially key connected consumer experiences. By formulating these into Experience Targets, measurable objectives and common goals for innovation can be set for all partners. The targets provide a common focal point for generating compelling user-experience solutions. They become landing zones for technology research results, design solutions and new business models, which facilitates the creation of future solutions, next generation product platforms and new design paradigms.

Slice of Life: Personas and Experience Targets form the basis of the Slice of Life method used by the TO:DO:SO consortium. A Slice of Life is an every day story that brings a Persona's needs to life. It consists of a number of moments of user activity that cover several locations, devices, features and applications. Philips Design has previously shown an example of a Slice of Life with the Intuitive Connected Home I (ICH-I) demonstrator at Philips Research Internal Central Research Exhibition 2004. In 2005, the TO:DO:SO consortium's Intuitive Connected Home II prototype (ICH-II) used three interlocking slices, based on the lives of three Personas, to demonstrate how people can enjoy, share and creatively use digital content in simple, effortless and highly intuitive ways .

Rather than focusing on the devices or applications themselves, a Slice of Life describes the experience across devices and locations. A Slice of Life therefore does not include in-depth details of any device or application but only what is relevant to the activities in question. Each moment of user activity should make sense on its own and illustrate a compelling moment of user experience. It should also show how technologies can benefit users when applied in an ingenious way. The three slices of the ICH-II demo presented a seamless fusion of home entertainment with lifestyle, well-being and healthcare applications.

Seven Phases

Overall, the Slice of Life demonstrator is created in seven main phases involving all TO:DO:SO project partners. Phases 1~3, 4~5, and 6~7 are related to the bottom, middle, and top boxes of the innovation matrix for Horizon 2, respectively.

Phase 1 – Main trends and starting points

A kick-off workshop focuses on aligning the objectives of all technology partners, key focus areas are identified, and a limited set of sensible and feasible use cases defined.

Phase 2 – Draft 'slice of life' scenarios based on personas

A number of Personas are created whose consumer insights allow Experience Targets to be defined. Drafts of high-level scenarios are developed based on the Personas as well as the shared objectives of all partners. These scenarios help identify where partners' technology could be applied, and shows the key benefits of their innovation in a human-focused experience context.

Phase 3 – Scenario refinement and rational definition

The draft scenarios are filtered and refined into use cases by matching and scoring them against user needs, available partner technologies and, eventually, business models. For each use case, the partners identify the combination of precise technologies that would enable the user experience in the best possible way. Typically, a number of iterations are needed to finalize each use case in detail. Since the creation of a tangible demonstrator is the final aim, some attention is already paid to how the use cases could be prototyped.

Phase 4 – Experience demonstrator definition

To ensure that the demo is believable and that the demonstrated user experience is achievable within the given timeframe, it is important to identify the right level of prototyping for each use case in the Slice of Life. This also serves to ensure that the user experience remains the focus and that concessions are not made because of technical limitations. Where possible, a decision is made to integrate real working technology and platforms into the demonstrator to stress its feasibility. In some cases, where integration effort would outstrip value to the demonstrator, the use cases are simulated to specification. As a result, each of the use cases maps to technologies that are either already available or on the roadmap of at least one of the partners.

Phase 5 – Experience demonstrator creation

An experience demonstrator is then created consisting of simulated and real working technology elements. The demonstrator should clearly illustrate compelling and innovative user experiences that correspond to the Persona's needs. They are enabled by a combination of new technologies, design solutions and business models.

Phase 6 – Communication

A communication story is then created that shows the developed demonstrator from an end-user perspective. In this way, the value of the technology IPR is clearly demonstrated by showing its relevance in an everyday context.

Phase 7 – User and business feedback

User feedback is gathered through the early testing of the tangible concept prototypes. It is important that the testing of tangible concepts is not confused with usability testing or product testing. The objective here is to receive feedback on the principles of the solution rather than the solution as presented, since it is not a finished product proposal. As a part of this, the validity of the Experience Targets defined in Phase 2 can be tested.

As an example, Philips Design applies its Creative Consortia Vision to examine white space opportunities. These are the emerging gaps between existing companies where new innovations may occur. The link to technology is clear from the TO:DO:SO approach, which also enables the necessary level of experimentation. The use of personas and other similar tools and methods provides the necessary ethnographic input. This approach delivers first-of-a-kind products which can be fed directly into Philips incubators, which are special entities within the Philips organization intended to promote the creation of feasible new innovations.

Intuitive Connected Home II

The Intuitive Connected Home II (ICH-II) demonstrator (Philips Design, 2005) is the first result of the TO:DO:SO initiative, and it shows the clear advantages this way of working brings. It involves technological innovations and input from Philips Research, Philips Semiconductors Advanced Systems Lab, Philips Applied Technologies and Philips Design. Guided through the phases of the creative innovation process described above by Philips Design, the TO:DO:SO project partners collaboratively conceived of the Intuitive Connected Home II demonstrator.

The Intuitive Connected Home II presents a challenging vision for the future of connected living. It shows how people can enjoy, share and creatively use digital content in simple, effortless and highly intuitive ways. By aligning developments in design and technology, the demo presents a seamless fusion of home entertainment with lifestyle, well-being and healthcare applications. The demo is set in three next generation connected homes belonging to the Personas Aaron, Jasmine and Jean. It illustrates potential connected consumer experiences in three to five years time. The prototype focuses on moments of user activity that demonstrate how the users can realize their intentions across several devices and locations. Each use case in the demo highlights the application of one or more relevant technologies utilizing Philips technologies from the project partners. By introducing user needs as a focal point, Philips Design facilitated the application of these technologies and led to the development of use cases that matched consumer insights. The resulting interface

and interaction elements focus on a user experience of simplicity and are based on the principle of intuitive and creative flow, as well as on intelligent and adaptive features.

Aaron's World of Sports and Music

For Aaron, a socially active 23-year-old student, the demo presents an enhanced music experience for a sports lifestyle (Figure 12). It shows how he can intuitively search through his music collection, create playlists on the fly and transfer music to his mobile phone by touch. On the move, he can intuitively and legally create a proximity-based shared playlist with his friends, enjoy the music synchronously during sports and later access and easily purchase the new, shared music when alone.

Jasmine's 'Circle of Care'

For Jasmine, a 36 year old working mother, the focus is on simple ways to maintain a circle of care with her mother-in-law, and to creatively share experiences with her family, whether together or apart (Figure 13). Jasmine's family is able to stay aware of her mother-in-law's health status. More, they can also intuitively share photos with each other and create a shared slideshow on their respective living room TVs, fluidly joined in a simultaneous social activity.

Jean's 'Home Help'

Jean, Jasmine's 65-year-old mother-in-law, is recovering from a heart condition. The focus here is on smart simplicity and assistance while browsing content and using her healthcare applications at home (Figure 14). At home, Jean can easily retrieve, browse, display and print digital media content and carry out self-monitoring for personal healthcare. She can do this in a natural and intuitive manner with the assistance of a new tangible pointing interaction paradigm and an emotive and smart home dialogue system.

Examination Findings

Philips' innovative TO:DO:SO approach has enabled a free flow of information between partners from design, research and business, and it has helped facilitate a shared language by focusing on a tangible articulation of new digital solutions. This has resulted in a shared and realistic vision for innovations that is in line with technology research roadmaps, digital product platform

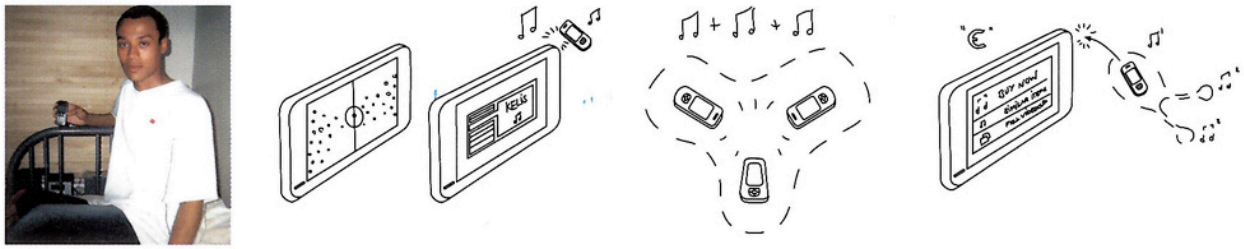

Figure 12. Aaron's world.

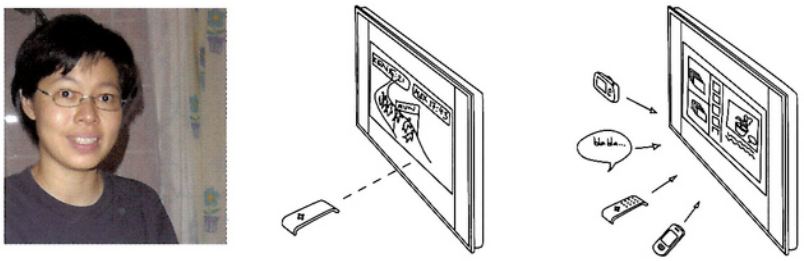

Figure 13. Jasmine's world.

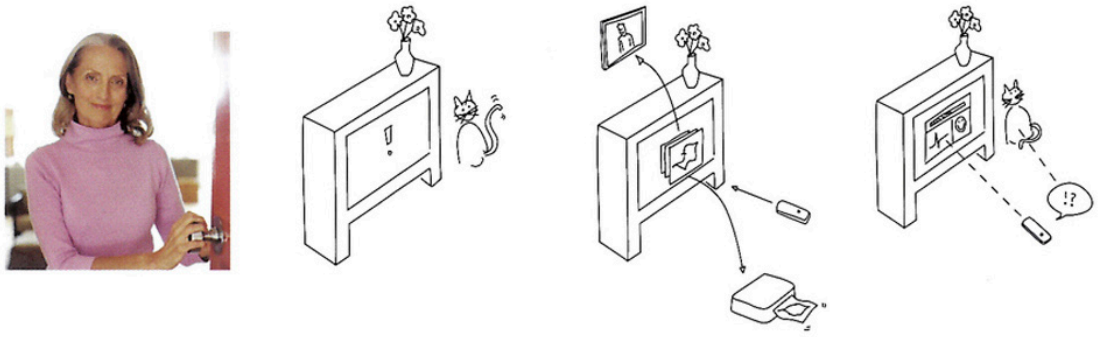

Figure 14. Jean's world.

development and, most importantly, is based on consumer insights. Indeed, by working together for the future, Philips Design, Philips Research and the product development labs are maximizing the opportunity to create highly desirable and human-focused new solutions that provide value-added differentiators for Philips. There are four main benefits:

1. **Enriching Competitive Position**: Working together generates considerably more progress in each of the otherwise separate research domains. By combining advances in emerging technologies and user-led design, it has been possible to propose new applications that point out the human value of Philips' technology IPR and create inspiring insights for next-generation product development. This combined approach allows the early discovery and protection of realistic opportunities that have the potential to add a competitive edge to Philips' business.
2. **Unlocking Creativity**: TO:DO:SO has intensified the working relationships between the disciplines by identifying and agreeing on the goals of the projects at the earliest stage. This releases more creative possibilities and options, which in turn can be rigorously tested from all standpoints without the fear of being rejected on the grounds of not being invented there.
3. **Sharing the Vision**: A key aspect of the TO:DO:SO approach is that it uses the joint development of a tangible vision demonstrator to mutually engage the partners around a common goal. This creates a rallying point around which partners can discuss ideas, technologies and user insights in a very concrete context. It also enables projects with different timeframes to work together, align mutual interests and inspire each other. As a synergetic outcome that combines design, technology and business roadmaps, the experience demonstrator is considerably more powerful in projecting the ideas of all the contributing partners than presenting them individually.
4. **Focusing on People**: By incorporating end-user insights from the start, the collaborative TO:DO:SO approach leads to solutions that both make sense to people's lives and leverage technology assets. Ultimately, this will help Philips' business prioritize opportunities that can deliver on the Sense and Simplicity brand promise. Also, by emphasizing context of use and cultural relevance, the human value of technology is underlined and any risk that technology-push strategies might occur out of human context is minimized at the earliest stages.

Navigating the Innovation Matrix

Although we have not studied Horizon 1 in any detail here, what all these examples show is that effective innovation is about managing this entire chain in a clever way. There are many kinds of links and path directions between the various matrix squares. The most important aspect of this way of looking at or managing innovation, especially design-led innovation, is the way in which innovation is led through the matrix. Who actually leads innovation through the matrix is also of paramount importance.

Finding the best way through the matrix is crucial in bringing imaginative ideas effectively to the market (Figure 15). It is equally important when moving in the other direction, as is the case when ideas from Horizon 1 enter the incubation area in Horizon 2, or provide ideas for new territories in Horizon 3. Managing the crossroads between matrix squares is therefore vital. The chances of success will also be increased when there is what is known as a passionate champion.

Passionate champion is a term used by, among others, Harley-Davidson in its new product development model (Reese & Oosterwa, 2003). The early stages of this model embrace the same kind of free-thinking attitude proposed by this paper. It tells its people, for instance, that "product development is bounded only

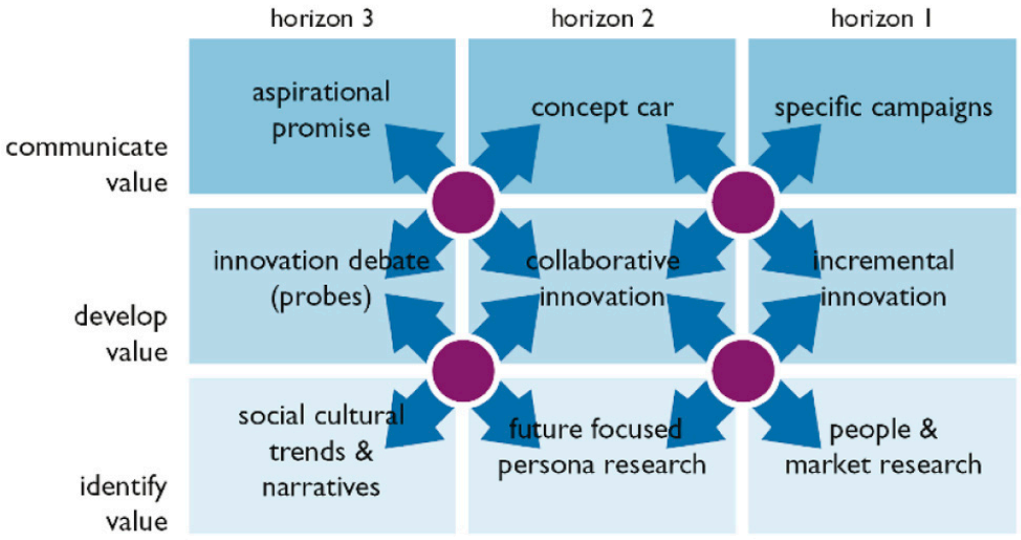

Figure 15. Routes to navigate the innovation matrix.

by your creativity" (p. 3). It also adds that, "you can do anything–but you can't do everything" (p. 3). A model for the initial phases of product development, known as the swirl, is also presented. This idea sets out that ideas initially swirl around, competing for attention and legitimacy, until they pass through a zone of consideration and ultimate acceptance. Concepts and ideas stay in the swirl until they evolve, expand, contract and are adopted by a passionate champion who can promote and sell the concept throughout the organization.

The discipline of design, and designers in particular, can and do play a major role in being a passionate champion. The design discipline has by nature considerable expertise in integrating technologies, generating and interpreting end-user insights and marketing information, and above all, visualizing outcomes, all of which enables the discussion needed for successful innovation. Although not all creative professionals are designers, many are, and those creative professionals who conceive of the idea that weaves its way through the Innovation Matrix are particularly reluctant to let go of it. They suffer for their ideas, are passionate for them and, in our experience, are never ready for the moment of exchange when an idea is tossed over the wall to the next group of people called upon to work on it. Rather, they prefer to stay with the idea, nurturing it as it progresses not only through the matrix, but onwards and out into the market place.

A way of understanding the passionate champion is to look at it through the BBC program, the Dragon's Den. This is a reality program in which contestants (entrepreneurs) vie for the funding of the investors (dragons). Most often, it is the passionate champion, the creator of the idea, who is sought by the dragon and not the idea itself. The dragons know that as the idea is invested in and it progresses, it is likely to be changed, to grow and be repositioned, especially if is introduced into new commercial contexts. Therefore, it is the passionate creative who is needed to champion the growth of the idea and nurture its maturity over time. Without realizing this truth, we believe that a valuable idea can be eschewed and will risk being lost in the trough of despair simply because it is just too difficult to see it though.

Erik Bjornard, in his reaction to the article "Method, not Madness" (Farah, 2005) nicely illustrates the role of the passionate champion as he asserts, "An undeveloped idea, no matter how great, isn't worth much. It seems that innovators get a lot of praise for great ideas and unique solutions, but their real gift is not 'out of the box' thinking. It's in their rare ability to breathe life into delicate ideas. Without recognizing the incredible value in the ability to grow an idea, we're selling great 'innovators' short" (personal communication).

Conclusions

One of the great attractions of this matrix-based approach is that it offers more possibilities for generating innovation than the traditional linear approach. It does not see the innovation process as a one-way street; ideas and concepts can pass in many different ways between the various squares in the matrix. This means that there are greater possibilities for feeding ideas from current business back into the innovation process to come up with something new.

The matrix approach also identifies that very often the real focus in Horizon 3 is not to force the business case on a new idea, but instead to develop equity that can be used to leverage the brand in the future. What is also important at this stage is to identify and protect territories that could lead to profitable intellectual property income streams. It is also clear that different competences, capabilities and personal profiles are required for each horizon. By using design as a research tool to develop imaginative ideas, while also using design to present these ideas in different ways depending on their place in the matrix, one can ensure maximum acceptance by the different stakeholders in the process.

Possibly the most important and overriding message of this examination is that making innovation more successful requires managing imaginative ideas in different ways, and not by following the well-beaten path that all too often ends up being a road to nowhere.

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