

Future Scenarios and Product Design: A Contextual Model

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Abstract (200 words)

Design is a creative and prospective discipline. More than predicting them, design creates futures. From a business perspective, research needs to situate new products in plausible future contexts, in order to reduce risks and improve innovation.

The creation of future scenarios can be seen as a starting point for designing. They have the potential to help the design industry create products inscribed in a particular and defined context. There is a twofold advantage. Firstly, designers can use the proposed scenarios as tools to create new solutions. Secondly, if the scenarios are appropriately constructed, the business risks decrease. This is because the product would respond to the needs and opportunities defined by informed decisions.

This paper describes some methodologies used in different disciplines for scenario building, including business and marketing. It mentions some examples in design, highlighting the difference between trends forecasting and scenario building.

A new model for building future scenarios is presented: contextual futures. The model helps create contextual starting points for designing. It makes use of tools such as *Delphi* and the *ViP* approach.

The paper shows some examples of projects carried out at Victoria University of Wellington with industry partners, as part of the Design Led Futures initiative.

I. From Trend Forecasting to Future Scenarios: A Theoretical Approach for Designing

Martyn Evans argues that in the design discipline there is no commonly accepted approach in trend forecasting, or the creation of future scenarios. Evans investigates the current trend forecasting methods in order to apply them to the design discipline (Evans, 2005). The study analyses how design teams approach trends and forecasting. It involves applying forecasting techniques from other areas to the design process. The study of trends is not really the creation of *new* alternatives, rather something that is already happening.

Specialists in trend forecasting have the task of detecting potentially successful trends for the market. The trends they look for already exist in society, often in small social groups and in the early stages of development. The trend forecaster's role is to sense, evaluate and present the trends to the design team. They may also be a part of the design team. The design team's role, from this perspective, would be to increase the intensity of the identified trends, by designing products based on those trends.

The design discipline is inherently creative. One critique of trend forecasting is that it does not involve as much creativity as design is able to offer. Trends forecasting implies the definition of limitations for creativity in design. However, this has proved successful from a business perspective. Design studios such as IDEO and Philips Design use a myriad of techniques to forecast trends in the market in order to respond to them.

The scope of studying trends is limited. Their goal is to respond to appearing trends, and the needs and demands of people, in order to gain markets. Building future scenarios as a starting point for designing offers a wider range of action.

I.1 Futures studies

The Performance and Innovation Unit of the Strategic Futures Team, British Cabinet Office has released publications on future forecasting. *A Futurist's Toolbox: Methodologies in Futures Work* (Strategic Futures Team, 2001a) outlines the different methodologies that futurists use to forecast scenarios.

Understanding Best Practice in Strategic Futures Work (Strategic Futures Team, 2001b) outlines the process to construct future scenarios. The unit suggests a scenario development process that comprises five stages.

Stage 1 assesses the organisation's current state of thinking about the future in order to determine threats, opportunities, barriers to change, etc.

Stage 2 develops a range of drivers, conventionally based on the STEEP categories (Social, Technological, Economic, Environmental, Political). Some groups add an organisational driver. These drivers are the factors that most likely influence the organisation. From a product design perspective, the drivers could be seen as the factors that represent the context in which the products will exist.

Stage 3 is normally a one-day workshop in which participants review and prioritise the drivers.

Stage 4 consists of uncertainty analysis. This sets apart the most influential and most divergent drivers. They are combined to construct the axes of the scenarios.

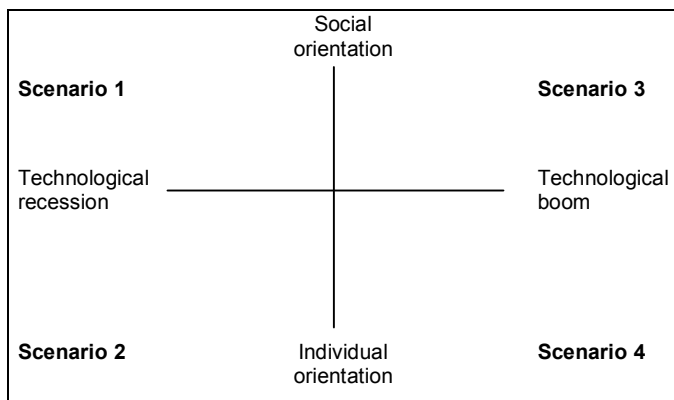


Figure 1: Example of axes to set scenarios. Each quadrant generates one scenario.

The scenarios are developed in Stage 5 as a result of the different axes. They can be descriptive, narrative and the complexity may vary in depth.

It is important to highlight the difference between global scenarios - or macro scenarios - and design scenarios. Global scenarios are those that exist regardless of designer intervention, at least directly. Design scenarios are those that designers create as a base or starting point for designing (Jonas, 2004).

This can be viewed as defining contexts. The design is the solution to a problem. The context defines the problem. Alexander (in Jonas, 2004) points out that 'the real object of discussion is not the form

alone, but the ensemble comprising the form and its context'. The context is part of the problem and specifies the constraints in which the object might exist. The design produced needs to fit and co-exist in its particular context. Therefore, it is necessary to define such a context to the best of a designer's capabilities.

There are factors that remain unchanged and some that change rapidly. Products are normally projected months or even years before they enter the market. Some of the factors previewed might have changed by the time the object reaches the user. How can designers define such future context in a more informed manner?

Business experts use Delphi studies to create scenarios in order to make informed decisions. The methodology is relatively simple. First, the research team defines the scope of study. A number of experts are approached to contribute their view on the future state of affairs (5, 10, 20 years) in their area. All responses are compiled into a document that is sent back to the participants, whilst maintaining their anonymity. The respondents assess the replies of their peers and in turn reconsider their own (initial) responses. This iteration is repeated a number of times until there is relative agreement in the possible future scenario proposed by the group.

Some other studies, such as that described by Evans (Evans, 2005), prefer to offer a few probable scenarios that would depend on whether some events take place or not. For instance, one scenario would depend on whether an affordable memory stick's capacity reaches 10 gigabytes during the next five years. A different scenario would depend on the amount of elderly working after retirement by 2010. Such scenarios depend on factors that are almost impossible to predict, but are known that they will play an important role in the context of the user-object relationship in the future. Consideration of such scenarios informs companies in the creation of potential solutions.

Many companies are developing future perspectives as part of their decision making process. Siemens publishes *Pictures of the Future*, in part to advertise their development of new technology. It is not really focused on design (<http://www.siemens.com/pof>)

Philips Design has a number of projects trying to forecast the future. Delphi is a project in which Philips Design develops a number of future scenarios and the values important for people in such circumstances. They have also made public *Vision of the Future*, in which they experiment with state of the art technology to suggest possible future objects. (<http://www.design.philips.com>)

Shell has done extensive studies to forecast the future with the particular goal of assessing the future of fuel. They have published some of the results and are now trying to diversify their business strategy due to the upcoming scarcity of oil. (<http://www.shell.com>).

The next chapter highlights European universities involved in the development of relevant research on future scenarios and design. It is not an exhaustive study; some of their methodologies are briefly explained.

II. Studies of Future Scenarios in Design. Tertiary Institutions

For confidentiality reasons, it is not possible to show the methodologies companies use to study future scenarios. This chapter covers a brief explanation of tertiary institutions methodologies and projects. The research focused on European schools. However, some non-European institutions are also included. Several companies are included because of their strong focus on studying future scenarios in collaboration with universities.

II.1 Politecnico di Milano

In the design field, Ezio Manzini is recognised as one of the leading researchers in building future scenarios for designing. Manzini uses a similar approach to that described by Evans and calls it *Virtuoso*. He has worked on the subject focusing on issues of sustainability. Manzini and Jègou (2000) propose a theoretical framework defined as *design-orienting scenarios* (DOS).

Managers of many areas use the description of possible future scenarios to evaluate macro trends in their particular areas of activities. Normally, they use scenarios to discuss political and economic decisions. These are Policy-Orienting Scenarios (POS). They are intended to help managers make decisions mainly by changing policies.

As opposed to POS, DOS is not intended to smooth the progress of political decisions. Instead, DOS are visions of possible futures created to assist the design process. Such visions need to be feasible proposals open to assessment.

Manzini numbers the design-orienting scenario characteristics as:

- Plurality: alternative solutions are developed
- Feasibility/acceptability: the solutions are assessed in real and current contexts
- Micro-scale: analysis of life contexts, including different levels on which individuals or groups of individuals perform particular actions
- Visual expression: coherent contexts and proposals are presented.

DOS would be designed in part by industrial designers. They would represent the context in which future solutions have to exist. For Manzini, their main purpose is to establish a starting point to define what a sustainable scenario could entail. It is necessary to compare those ideal scenarios with the current reality, in order to ascertain their feasibility and a way to achieve such environments. This approach was used in the project 'Sustainable everyday'.

(http://www.triennale.it/triennale/sito_html/quotidiano/eng/home_.html).

Manzini is also developing the *Virtuoso* scheme. It takes into consideration that society constantly emits different kinds of signals. The signals can be very weak. Somebody detects the signals and extracts them from reality. That person can reinforce the signal, for instance by presenting it in a conference or by introducing it to the market. Designers detect these signals and work with them, although this normally occurs unconsciously. Manzini's team tries to detect the signals by studying social contexts. When they find a promising signal they extract and reinforce it, sometimes by designing something around it. The goal is to produce a positive cycle in which the signal keeps growing eventually affecting the whole society.

II.2 University of Art and Design (UJAH) Helsinki, Finland

UJAH is developing projects with a similar approach. The *Humantec* project had the goal to develop furniture solutions for small and medium-sized European manufacturers, particularly considering issues of a 'knowledge society'. They conducted a Delphi study and asked a number of experts to reason about the future on cognitive, social and physical spaces that would affect 'knowledge work'. Once the UJAH team had built possible future scenarios, designers took them as the starting point to develop solutions envisaged to exist in such scenarios.

The complete design process is described by the team as:

- Identification of key design-drivers
- Creation and polarisation of decision-focused scenarios
- Conceptualisation and visual embodiment of ideas
- Validation or modification of ideas via expert evaluations, interviews with potential users and so on.

Design for Future Needs (DFFN) project, European Commission

DFFN is a project that attempted to use design methodologies and processes to help decision makers foresee and plan policy work in the European Union (EU). The Europe-wide research project found examples of how designers 'visualise the future, project scenarios and explore the value of new innovations' (www.dfn.org/research.htm) considering the demographic changes and the way people live and work. DFFN suggests ways in which design can 'play a part of planning and foresight for industry, the public sector and EU policy'.

DFFN pinpointed more than 90 examples of companies and organisations in which future- focused design has played a role in shaping decisions. Research into their work has contributed to their final project report. In-depth case studies were researched and written. They focus on how design contributes to futures planning and helps organisations to prepare for changes in lifestyle, demographics and technology; and solve problems and respond to socio-economic challenges and opportunities. The case studies include:

- *British Airports Authority (BAA) Terminal 5 project.* This project studied technologies and environments that will make it easier for people to travel in increasingly busy European airports, particularly Terminal 5 at Heathrow Airport.
- *Humantec.* This project examined how changing working patterns will demand the development of different forms of office and home furniture during the next decade.
- *Whirlpool Europe.* The case study aimed to understand the role of forecasting techniques in the development of products and services by focusing on two recent Whirlpool research projects. One looked at the needs of couples in various European countries to build up a picture of domestic life; the other explored customer preferences in relation to the laundry process.
- *Decathlon.* The case study looked at design forecasting techniques and their impact on the New Product Development process for the sports gear company. It also considered how design could be used as a forecasting tool.

The results were made public in the *Future Perfect* Conference, in the DFFN website.

II.3 Technical University of Delft (TUD), The Netherlands

TUD has also developed design projects using the building of future scenarios. For instance, the *Sus-house* project analyses possible methods of sustainable living, in order to take the corresponding design decisions to achieve such scenarios. DfS also makes use of Delphi studies. One example of such use is a study they did to forecast the future of recycling technology. This would help designers to decide which recycling options for the objects produced today will be effective in the future (when the objects will require recycling).

II.4 Design Academy of Eindhoven, The Netherlands

The IM group has developed projects regarding the role that designers can play with respect to the needs of people in the 21st Century. The *Nomadic Dwelling* project explores the different needs and opportunities that arise when people are not confined to a single place. The results included scientific overviews of demographic nomadism, the creation of personal routing maps, sophisticated clothing and housing systems. They consider the context in which humans live, in order to understand how design can participate in such a context. The definition of the contexts can be in the future. This means that the construction of contexts is also the building of future scenarios.

II.5 Royal College of Arts (RCA) London, Great Britain

The Royal College of Arts in London has developed projects on futures and design in partnership with industry. One example is *Moving On*. The project explored the future of city transportation and how public transport would change in response to 'more efficient, safe and enjoyable access to work and learning; shopping, friends and leisure'. (<http://www.hhrc.rca.ac.uk/events/movingon/default.html>, retrieved 18/5/05). The project was developed in collaboration with the Helen Hamlyn Research Centre (<http://www.hhrc.rca.ac.uk/>). The HHRC examines the design implications of social change and promotes a more socially-inclusive approach to designing. It administers the Design for our Future Selves Awards.

II.6 State Academy of Visual Arts Stuttgart, Germany

George Teodorescu specialises in Integral Design, future scenarios and radical innovation. He claims that design has the power to suggest radical innovations that can break the stagnation of many markets. One of the projects his team has worked on is the use of CACACO. This is a new carbon composite that offers a great capability to heat. Many products were developed using future scenarios and user behaviour. The solutions are now being investigated by private companies for future production in an agreement between Germany and South Korea.

II.7 Royal Melbourne Institute of Technology (RMIT), Australia

Manzini led the project *Queensland Design Futures*, in Australia. Designers, urbanists, architects and theorists participated in suggesting design solutions for the Queensland community. The main goal of the project was to propose solutions towards sustainability (<http://www.teamdes.com.au/desfutures.HTM>). The project uses many of the techniques and methodologies developed by Manzini explained above in the Politecnico di Milano section. On the other hand, the theoretical approach differs mainly in the use of ontological principles.

III. School of Design, Victoria University of Wellington, New Zealand

The *Design Led Futures* programme is a joint initiative between the New Zealand government, leading manufacturers and Victoria University School of Design. It is a rare opportunity for industrial design to offer holistic future scenarios that encourage an open and free discussion about how we wish to live in the future. It is based on the premise that, as a creative discipline, design has the opportunity to do more than simply respond retroactively to changes in society and culture. Indeed it has the responsibility to take the lead and actively participate in defining them.

Most of the information we receive about the future comes from science fiction movies or rather depressing (and probably accurate) scientific studies that inevitably seem to suggest that mankind is doomed and that the future of the earth as we know it is limited. Industrial designers have done very little to offer alternative perspectives, which leaves people either worrying about just what *will* happen or even worse, simply ignoring the future.

As an undergraduate programme, Design Led Futures is intended to empower students by demonstrating that they can bring about meaningful change, in the form of optimistic and achievable futures. To do so the students work in teams of 4-5. They develop a challenging shared future living scenario and accompanying brand. The pilot project (2004) addressed home appliances for the industry partner Fisher and Paykel. Each student selected a task they wished to explore, such as caring for clothes or preparing food, and developed their own specific product.

The students are encouraged to reflect on the fundamental task performed by the product. In the case of a simple and potentially dull product like a fridge its main function is to store food to make it last longer. From here they can explore ways mankind has historically gathered, stored, prepared and presented food, how people store food now, or consider emerging technology that will allow us to store food in new ways.

As an example of the possible results from these types of questions, one group, *Project* proposed a more efficient or profitable model for occupying domestic space, perhaps as cross leasing or time sharing. The created neutral space takes on the personality of individual occupants via appliances that generate images in response to their differing lifestyles.

Bjorn Hulman's fridge from the *Project* group had an internal camera that projected an image of the food inside onto the door of the fridge. Once the door could be manipulated digitally, he explored additional information that could be displayed; including highlighting food approaching its expiry date; food as suggestions for recipes; or automatic shopping lists. Once he had developed these multiple layers of information his concern became the complexity and dominance of the technology over the simple act of storing food. To resolve this he developed a sophisticated fridge door based on the principle of a traditional roll top desk that was able to magnetically de-latch at any joint. This would mean that the door would automatically move as a person reached for the food within. This required substantial technical development, but created a product that was simpler to use for a person who just wanted to keep their food longer.

To physically connect the designs, the products are built into a collective architectural model that allows an understanding of each product in context and an overview of each group's work combined. The architectural context requires the students to work with other disciplines and forces a broader understanding of the relationships between products, places and cultures.

The *Range* group built their philosophy around a decomposable material similar to egg cartons. The industry partner had already developed the technology to produce it. This did not limit the creative potential of the project. The team suggested that suburban trends worked on a time frame more like fashion or car design and that every ten years the houses should be bulldozed and relocated to another site.

If that was not enough they extended this to move entire cities to let the land beneath the building breathe again and regenerate as farmers have done with their fields for generations. This is a classic example of an old idea re-introduced through the use of an emerging technology.

When the future scenarios are presented the aim is to get the viewer to go beyond simply thinking analytically about the proposals to a point where they are personally feeling and emotionally connecting with the visions. This state we have termed "emotional resonance", from here the viewer starts to invest in the visions and explores them from their own perspective. This allows for another modified vision to develop and the process continues on exponentially.

It is surprisingly difficult to get students to value their emotional feelings. Katherine Watson from the *Element* group developed a dishwasher that she justified with all sorts of technical detail, however when pushed she eventually admitted that all she wanted was a dishwasher that she could "cuddle in the morning". She explained that when she went into the kitchen on a cold winter's morning the only active, warm and almost alive thing in the room was the pre-programmed dishwasher. The solutions created by the students are often not easily accepted but that is the very value of them. The concepts proposed are not technically impossible but they are culturally and socially extreme. This allows a stretching of our own creative boundaries that will inevitably bring about a more diverse and explorative understanding of the potential future that design can offer.

Once people have been exposed to the types of scenarios mentioned above, what seems reasonable, possible and imaginable is quickly expanded and it becomes evident that we will have the future that we can first imagine and then work towards, and that is the real goal of *Design Led Futures*.

IV. Future Scenarios in Design: A Contextual Model

Hekkert and Van Dijk argue that 'the design of a context should be the start of all design projects' (Hekkert & Van Dijk, 2003. p.1). The definition of 'context' is 'the interrelated conditions in which something exists or occurs: environment, setting' (Encyclopaedia Britannica, 2002). It would be an impossible task to define *all* the conditions related to the setting or environment in which an object exists. Instead, Hekkert and Van Dijk suggest that designers have the choice to define which factors are most relevant for the existence of new products. Some of the factors are decisions that the designers have to make based on personal values or interests. The designers form a position that sets parameters both explicitly and implicitly. At this point the personal choice of the designer is of great importance.

This approach can also be applied to the definition of future contexts, or future scenarios. It is even more difficult to define what a future context might be like. The designer's personal decisions play an important role. These can be informed decisions if some of the forecasting futures methodologies are applied.

The justification to define first a context for designing objects comes from considering the objects on three levels. The first level is the material characteristics of the object itself. For instance, a digital camera is made out of plastic, with electronic components inside, a particular type of lens, memory, buttons, display, software, etc. These are the characteristics inherent to the object isolated from anything else.

The second level refers to somebody's interaction with the product. The digital camera attains this level when somebody uses it. Such use creates a relationship that also inscribes different levels – emotional, aesthetic, physical, cultural, etc. The person using the camera might feel satisfied with the accessibility to menus; the aesthetics might make the designer feel proud, etc.

The third level sees the relationship user-object in a larger context. The person is using the camera in a particular environment with intrinsic characteristics (Hekkert & Van Dijk, 2003). It is at this point where the contextual factors affecting the relationship user-object need to be defined. For instance, the designer of a camera could say that the context in which the object will exist is a big city within a G8 country in which the average worker commutes for approximately 45 minutes twice a day. Does this factor really affect the potential characteristics of the camera? Designers need to analyse the possible factors involved and decide which ones are relevant. For instance, it might be more significant to consider that the users travel for pleasure with their families more often than with friends.

Human life is complicated and varied. How can designers decide which issues to focus on? Beyond marketing research, which would normally dictate the marketing opportunities that designs should address, design research can start by setting a 'sphere of influence'. Such a sphere can be seen as a brief for designing. For example, the design could address 'the need of elderly to keep record of emotionally relevant events'. The design of a digital camera with such a specific domain should be significantly different to a digital camera with a sphere defined by 'the need of teenagers to interact with their friends'. These extreme examples would require the designers to define very different contextual factors.

This involves two important points. Firstly, the issues designers consider relevant can obviously be related to the area of research. It is here where the designer makes more personal decisions. It has been proven that introducing factors that are apparently not related to the area of research often result in innovative ideas (Snoek & Hekkert, 1999; Hekkert & Van Dijk, 2003). However, this does not mean designers should ignore the related issues.

Secondly, the factors to consider can be divided into three levels. Hekkert and Van Dijk classify them as states, developments and principles:

- *States* are general characteristics of the context that seem to be stable, but might change in the future. For example, the number of people over 60 years old in economically developed countries accounts for about 12% of the population. But this percentage is bound to change in the future and probably as an increase.
- *Developments* are factors in constant change. An obvious example is technology. The memory capacity for digital cameras is changing rapidly. Trends are also considered states. Young people in South Korea wear their backpacks over their lower back.
- *Principles* are factors that remain unchanged. Physical human characteristics such as gradual loss of vision and hearing at older ages are principles.

Defining which factors are relevant for a project, and which ones might provide sparks of creativity, is the role of the team proposing the initial design project i.e. clients, marketing personnel, and designers. Once the factors are defined, a context is created, or 'designed'. The design of the actual object takes place *after* the design of the context. The object should be inscribed and reflect the conditions of such a context.

Philips Design has used Delphi studies for suggesting how life would be like in the future (<http://www.design.philips.com/about/design/section-13478/>). The project aimed to address the questions: What will the world look like in the future? What values do people hold now, both as members of a society and as individuals? What values and attitudes do different generations hold? How might the world and all its different societies and ages change? How might it develop and refine itself and its beliefs and desires? The results have been used for designing diverse ranges of products, both for Philips Electronics and for external clients.

Combining future studies methodologies and definition of contexts can offer an alternative to designers. This can help them make more informed decisions and develop future scenarios that reduce risks to the companies.

V. Conclusions

The study of future scenarios is becoming increasingly important among tertiary institutions around the world, particularly in Europe. However, there are only a few universities developing systematic approaches to the study of possible futures. Some of the projects rely on intuition. Some others borrow techniques from other disciplines with more established future studies frameworks.

The methodologies found in future studies are intended to aid policy makers. However, it is suggested that such methodologies are modified for use in the design process. This could be done by first suggesting possible futures and then design accordingly.

The UIAH, *Design for Future Needs*, and the Politecnico di Milano, are perhaps the best example of an effort to apply future methodologies with the design process. The initiative *Design Led Futures* from Victoria University of Wellington represents a significant effort to establish design as the key force in identifying better futures, and ways to achieve them.

Design Led Futures started with projects that seemed to rely more on intuition than on systematic methodologies. However, intuition is more structured and informed than it may seem. Since completion of several projects for industry, the project now has a strong approach that continues to gain the support of industry partners and substantial backing from the New Zealand Government.

It is impossible to accurately predict the future. Furthermore, the number of factors influencing the future is infinite. Combining future methodologies with the definition of contexts as suggested in the ViP approach and DLF, can prove useful defining specific possible futures. These suggested futures could be starting points for designing. By doing this, designers have to define personal preferences when deciding which factors might affect their future contexts.

The designer's creativity and personal input is always a valuable asset impossible to substitute with systematic methodologies. However, some methodologies can help designers make choices and situate their designs in contexts that are created by informed decisions. This helps the designers, gives them a more defined context, and reduces risks for business.

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