

DESIGN RESEARCH METHODS FOR FUTURE MAPPING

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ABSTRACT

Although a strategy for business innovation is to turn a concept into something that's desirable, viable, commercially successful and that which adds value to people's lives but in the fast changing world, we are seeing weakening of relationship between product, user and the environment, thereby causing sustainability issues. A concrete futuristic vision will give overall direction to the efforts; it will also help us channel our energy and resources collectively for a more planned and sustainable future. This paper looks at various future research methods (forecasting techniques) used in the industry and evaluates their relevance and application to designing. The authors identified the importance of factors such as discovery of newer material properties, latest advances in technology realizability, socio-economic trends, cultural paradigms, etc. that have impacted the course of design visualization for the future. Thus, the available forecasting methods fall under these three paradigms:- Technological, People-social, and Environmental paradigms:- 1. Lastly, this paper identifies a need for coherent forecasting mechanism which makes the product designs of future more predictable, viable and thus, promote sustainability at large.

KEYWORDS

Future mapping, design research methods, design forecasting, business innovation

1. INTRODUCTION

Future visions help generate long-term policies, strategies, and plans, which help bring desired and likely future circumstances in closer alignment with the present potentialities. Businesses use futures methods to enhance understanding of future markets. Social leaders use them to develop and test both possible and desirable future visions (Glenn 2000).

'The future seems more complicated and more difficult than ever to forecast, yet people feel the urge, more than ever before, to know what lies ahead. It is of key importance for companies to satisfy this need by exploring the future and in this way remaining at the cutting edge and maintaining credibility and leadership' (Bevolo 2002). Any institution that takes care of present while planning for future, is more resilient to meet the needs of the society, both in the present and the future.

Furthermore, the use of futures methods enhances anticipatory consciousness, which in turn improves the foresight to act faster or earlier making the organization or individual more effective in dealing with change. (Glenn 2000)

However, the value of futures research is less in forecasting accuracy, than in usefulness in planning and opening minds to consider new possibilities and changing the policy agenda. Its purpose is to help us make better decisions today via its methods which force us to anticipate consequences in the form of opportunities and threats in future, and help us plan how to address them.

While many of the forecasting techniques rely on study and analysis of previous trends, their focus is confined to a limited scope. This limitation of scope is defined by the technique itself or its structure. Design Forecasting, on the other hand, requires a more holistic view and needs an overview on multitude of factors including technology, social, cultural and environmental symbiosis.

2. FUTURE MAPPING, FORECASTING AND BACKCASTING

Future mapping and Forecasting have come a long way from being a mere guess to crafting a calculated, scientific and more analytically accurate vision that could be useful in many ways. It is imperative to understand the basic structure and various parameters of forecasting techniques to understand their strengths and limitations.

2.1 Type of Forecasting Methods

The cornerstone for innovation forecasting is *monitoring* of specific data and further analysis. As cited by Evans (2003), Schwartz (1991) elaborated ‘The objective is not to get a more accurate picture of the world around us but to influence decision making inside the mind of the decision maker.’

Over past few decades, the list of future mapping methods and forecasting techniques have increased many folds to include enhancements over existing methodologies and certain newer approaches. However, broadly all these techniques can be classified on the basis of their nature of operation and focus.

2.1.1 People Centric Forecasting Methods

Many Forecasting methods have been designed with a base thought that some people are better aware about what is going to happen next in future. People centric Forecasting methods can further be classified on the basis of specialization or methodology.

A) Expert opinion

These methods involve the services of one or many experts in various relative fields.

Genius Forecasting refers to a more intuitive approach to forecasting. These techniques have been around for many millennia and has had wide acceptability among the common man who refer to these “gifted” *Oracles*. Some examples of this kind include Astrology, Tarrot card reading, Janam Patrika, Palmistry, etc. Many mainstream science researchers debate a lack of scientific rationale or logical explanation and claim that forecasting is often based on *intuition*.

Delphi Forecasting relies on combined knowledge of many experts. Proposed by Helmer et al (1959, 1961), a Delphi panel includes experts from various disciplines. The primary objective of this method is to obtain the most reliable opinion consensus of a group of experts by subjecting them to series of questionnaires interspersed with controlled opinion feedback.

B) Collective intelligence (Mass opinion based techniques)

Social Forecasting is a relatively recent method that works on *swarm intelligence*, collective intelligence of stakeholders. It is an innovative method to rely not on the experts’ but common man (stakeholder’s) intellect. The basic premise of this technique is that stakeholders are motivated to participate in this *Game of prediction* with some real time rewards.

2.1.2 Data Collection and Trend Analysis Based Forecasting Methods

Previous data from the past years is collected and studied closely. A trend or pattern is identified, which is further used to lay predictions for the future. These methods work well for the activities and cases in which we already have a good background data available.

These techniques of Forecasting can further be divided into three broad categories:

A) Data Collection

Bibliometric Analysis and Scientometric Analysis refers to collective information of all the research patents

B) Causal Models

Causal models indicate possible causes of a particular incident or anomaly. In *Futures Wheel*, the central term describing the change is positioned in the centre while its following probable consequences (direct and indirect) are plotted around it thus creating a web of possibilities. Some examples of this type include Causal layered Analysis, Cross Impact Analysis, etc.

C) Trend Analysis

These methods examine trends and cycles in historical data, and then use mathematical techniques to extrapolate to the future. The assumption of all these techniques is that the forces responsible for creating the

past, will continue to operate in the future. This assumption falls short while creating medium and long term forecasts.

Choice of an appropriate model depends on the historical data.

1) *Exploratory Data analysis*:- Its purpose is to identify the trends and cycles in the data so that appropriate model can be chosen

2) *Decomposition*:- This weighted-smoothing technique mathematically separates the historical data into trend, seasonal and random components.

3) *Turning Point Analysis*

4) *ARIMA* models such as adaptive filtering and Box-Jenkins analysis

5) *Simple linear regression and Curve fitting*

Long Wave Analysis also known as *Kondratiev waves* (also known as *Supercycles, K-waves*) are supposedly cycle-like phenomena in the modern world economy. They represent cyclic repetition of some key trends over a specified period of time.

2.1.3 Creative Thinking based Forecasting Methods

The biggest advantage with Creative thinking based forecasting techniques is freedom of thought. This gives ample scope to the researchers to look at many aspects including society, culture on the behest of advanced materials, technology or even something that is non-existing. Furthermore, the time horizon of the vision can be expanded to many generations in advance.

Scenario writing proposes different conceptions of future technology or events by amplifying some of the important causal factors of today and projecting them in future. They are often written as long-term predictions of the future. Key advocates include Schwartz (1991) and Dearlove (2002) who proposed, "*think the unthinkable*" by creating alternate stories, or scenarios".

On the other hand, Altshuller (1956) proposed a very formal and systematic approach such *Contradiction matrix* and *TRIZ* research model, which is "*a problem-solving, analysis and forecasting tool derived from the study of patterns of invention in the global patent literature*" (Zhang 2006); other researchers such as Rhyne (1981) proposed Field Anomaly Method (FAR) that works on principle of exploration of all imaginable patterns and elimination of contradictory possibilities.

2.1.4 Simulation Models based Forecasting Methods

Simulation methods involve using *analogs* to model complex systems. These analogs can take on several forms such as

a. *Mechanical analog* might be a wind tunnel for modeling aircraft performance.

b. *Mathematical analog*: An equation to predict an economic measure such as *S-curve* and other multivariate statistical techniques involving relationships between two or more variables, such as *Multiple regression analysis*

c. *Metaphorical analog* could involve using the growth of a bacteria colony to describe human population growth.

d. *Game analogs* are used where the interactions of the players are symbolic of social interactions. It involves the 'creation' of an artificial environment or situation and simulate through set of assumptions and rules of interaction.

Other Simulation based forecasting techniques

Cross-impact matrix method,

Gordon (1994) recognized that the occurrence of an event can, in turn, effect the likelihoods of other events and thus, proposed Cross-Impact Matrix method to determine how relationships between events would impact resulting events and reduce uncertainty in the future. Probabilities are assigned to reflect the likelihood of an event in the presence and absence of other events.

Sustainability Analysis

This forecasting method uses an LCA (Life Cycle Assessment) tool containing carefully directed questions covering each life cycle stage to help product teams identify possible sustainability challenges, if any. The answers result in a qualitative colour-coded matrix that communicates sustainability impacts to non-experts and benchmarks the wholesome progress.

2.2 Backcasting Methods

While Forecasting is the process of predicting the future based on current trends and analysis, Backcasting approaches discuss about the future from the opposite direction. Backcasting identifies a desirable future and then works backwards to identify policies, programs and steps that will connect the future to the present. Backcasting is increasingly used in Urban planning and Resource management of water and energy. Many researchers, Glielk (1995), Lovins (1973) and Robèrt (1997) used it to develop effective models and methods for Sustainable future.

While future researchers previously concentrated on extrapolating present technological, economical and social trends in an attempt to predict future trends, more recently they have started to examine social systems as a catalyst to change. However, for design research through future mapping, there is a need to study the evolution of needs and aspirations of people / society, along with scientific discovery and technological developments. Backcasting can then be used to derive alternative implementation strategies that lead to these preferred future visions.

2.3 Comparison of Various Future Mapping Methods

Any forecasting or future mapping method has a common underlying structure which is based on following main components:- *Model (Concept); Data Assimilation; Data Analysis and trend identification; Management of perturbation; and Simulation*. While all of these factors are present in any method, the intensity of any individual factor may vary depending on nature of technique itself and the purpose of forecasting. When the discussed techniques are compared with respect to this common underlying structure, their divergent focus becomes clearly evident.

While some techniques require more openness of thought such as *Scenario Writing*, there is a starting model defined by an existing set of boundary conditions, initiated by data gathering and analysis, but the core focus is on the hypothesis simulation / articulation of vision. On the other hand, techniques, such as *TRIZ*, have a clear focus on data assimilation and simulation of the structure.

Techniques which have a stronger availability of historical data, *Trend analysis methods*, focus on rigorous Data Analysis and identification of latent trends, that can be used later for future projections. In these cases, since the vision is based on pre-existing casestudies, perturbations are much more controlled. While in methods which involve people on a mass level, *Social Forecasting*, the method is run in a controlled manner which helps in marginally controlling errors by cancelling individual biases and public opinions.

Table 1 comprises of an enhanced version of Taxonomy of Future research methods proposed by Glenn (2000), plotted against the above mentioned five structural factors. This clearly shows the difference in focus areas of various techniques. Furthermore, the table asserts the importance of Method, assimilation of data and simulation for each forecasting type irrespective of the nature of forecasting technique.

Table 1. Mapping of Forecasting techniques with reference to the structure and prime focus area

Forecasting technique	Model	Data Assimilation	Data Analysis and trend identification	Perturbations / (Chance of error) 1-less perturb, 3-more perturb	Simulation
Agent Modelling	1	2	2	2	3
Bibliometrics	1	3	2	1	1
Causal Layered Analysis	1	2	3	2	1
Cross-Impact Analysis	1	2	3	2	3
Decision Modelling	1	2	1	2	3
Delphi Techniques	1	3	1	1	1
Econometrics and Statistical Modelling	1	2	3	2	3
Environmental Scanning	1	3	2	1	1
Field Anomaly Relaxation	1	2	2	2	3
Futures Wheel	1	2	1	2	3
Genius Forecasting, Vision, and Intuition	1	2	1	1	3
Interactive Scenarios	1	3	1	1	3
Multiple Perspective	1	3	1	1	3
Participatory Methods	1	2	2	2	2
Relevance Trees and Morphological Analysis	1	2	2	1	3
Road Mapping	1	1	1	3	3
Scenarios	1	1	2	3	3
Simulation-Gaming	1	1	1	3	3
State of the Future Index	1	1	2	3	3
Structural Analysis	1	1	3	2	2
Systems Modelling	1	3	3	1	3
Technological Sequence Analysis	1	3	3	1	2
Text Mining	1	3	2	1	1
Trend Impact Analysis	1	2	3	1	1
TRIZ	1	2	1	1	3
Sustainability	1	3	1	1	3

Note: 1- has to be present but not the key focus area; 2- is also important; 3- is very important and key focus area

2.4 Key Areas of Application of Future Mapping Methods

On the basis of area of application of these forecasting techniques, they are further classified as:

2.4.1 Technology Forecasting

These forecasting methods focus on looking towards the future of technology by various techniques such as:

- Gathering intelligence data over current researches and areas of thrust (Bibliometric)
- Trend mapping and analysis
- Asking panel experts (Delphi studies)
- Doing Simulation (Scenario writing, gaming models, mathematical models)

Limitations: Overt dependence on data (historical or fresh market data), ability to see through the underlying trends. Furthermore, due to reliance on historical data, it is innately based on a premise of history extending itself, which might not be holding true always. The results obtained are good for short term forecasting mostly and fuzziness increases as we aim for long term, with increased complexity and depth of probing.

2.4.2 People / Social Forecasting

These forecasting methods focus on looking towards the people aspect of future. Focus is on evolution of human needs on individual as well as social level (Maslow's law). The past data is collected and analyzed to identify latent trends for the future. While in some other cases, focused interviews of domain experts (Delphi panel studies) help us get an insight.

Limitations: increase of fuzziness due to variation in thought of stakeholders. Exceeding reliance on large number for better clearer forecast is another limiting factor.

2.4.3 Environment related Forecasting

These forecasting methods deal with higher level of complexity due to increase in number of factors and variables. Besides Sustainability issues, what type of environment and type of resources that will be available in future, will determine the structure of design. Techniques like LCA (Life Cycle Assessment) help us take a step back and look at the product development and manufacturing in a new light. While the insights from

LCA analysis allow us to identify product development pathways towards better sustainability through an innovative process, it is equally relevant for people in the society and environment itself.

Limitations: There are very few environment related forecasting methods in this area primarily due to complexity of factors involved. LCA is a good simulation tool which can be realized on people, social and environment level also. Furthermore, there is a limited availability of research and domain expertise in this area.

Future mapping and forecasting are extensively used to aid in the process of policy making for future, wherein the deployment of specific forecasting method is dependent on objective, focus and nature of the project, E.g. involving society at large or environmental change related. However, to achieve better results, many forecasting techniques are used and combined to offset the weakness of one method with strength of another.

2.5 Future Mapping and Forecasting Techniques in various Industries

Reger (2001) highlighted Technology Innovation to be largely identified as an unstructured and unsystematic process. His studies show that various companies use numerous different methods/ tools for technology forecasting with different intensity. Lichtenhaler (2004), cited by Madnick et al (2008) also examined various companies' technology intelligence processes and his study indicates that information sources used to gather technology intelligence processes for forecasting are focusing majorly on Technology.

However, as is evident, a technological capability, attribute or parameter that can be forecasted to be available in future does not account for the aspirations of the society or need of the capability.

The newer technology is often building on older technology and thus, leading to capability increase or performance enhancement achieved through synergy. Predicting these synergies is the prime focus area of forecasts and thus, the environmental impact, sustainability and need of the society do not appear in the priority list while gathering information before forecasting.

Table 2. Intensity of use of different information sources used for forecasting in various industries*

Forecasting Techniques	Type	Pharmaceuticals	Electronics	Auto/Machinery
Publications frequency analysis, Publication citation analysis, Quantitative conference analysis, Patent frequency analysis, Patent citation, S-curve analysis, Benchmarking studies, Product Technology roadmaps, Product roadmaps, Technology roadmaps, Quality function deployment, simulations, portfolios	Technology	65.7%	62.9%	57.1%
Delphi Studies, Expert panels, Flexible expert interviews, Experience curves, Lead User Analysis	People, social	20%	28.6%	32.1%
Options Pricing Models, Scenario Analysis	Simulation, Technology	14.3%	8.6%	10.7%

Note: *Table 2 is a derived observation from analysis over Lichtenhaler's study (2004)

Furthermore, while funding of the technological forecast defines the priority and direction of the future vision, people's needs and aspirations are often easily missed. On the other hand, in design industry, the products are directly related to people's aspirations and thus, supported by people through marketing and sales. Thus, design research methods hold people / user's needs and aspirations as more pivotal.

3. DESIGN FOR FUTURE

3.1 Design, in Contemporary Context

Design, in contemporary context, not only looks at the concerns of manufacturing industry but looks at other equally important aspects on the various levels such as individual level (product itself, functionality), user level (user experience, user research, functionality), social, cultural, economic and environment level (sustainability, recyclability).

Sustainable design (also called environmental design, environmentally conscious design, etc.) is the philosophy of designing physical objects, the built environment, and services to comply with the principles of economic, social, and ecological (environmental) sustainability. Applications of this philosophy range from the *microcosm* — small objects for everyday use, through to the *macrocosm* — buildings, cities, and the Earth's physical surface.

Certain underlying principles of Sustainable design ("Hannover principles", William McDonough, 2000) include use of low impact materials, emphasis on Energy efficiency, improving quality and durability for better longevity, design for reuse and recycling, LCA (Life Cycle Assessment) among others. *Three Pillars Model* of Sustainable Design proposes three factors for optimal solution for sustainable Design: *Environmental impact, Economical profitability and Socio-cultural impact.*

3.2 Design Research Needs for Future Mapping

While products are the reflections of the time we live in, every new product design is a vision of the future, an endeavor to foresee how the user, the society and the ecosystem is going to be effected by it. An important strength of designers' capabilities is the ability to look into future and endeavor creating it. Page (1966) defined it appropriately in his famous quote 'the imaginative jump from present facts to future possibilities'.

Evans (2003) quoted Kevin McCullagh, from Seymour Powell Foresight (SPF), who talked about the multi-disciplinary approach in future research processes '*the system for integrating the examination of economic, social, cultural and technological futures into the design process*'. (Evans 2003)

However, historical reviews indicate that there are many influencing forces that govern the design expectations for the future.

3.2.1 Technology

A newer technology can bolster the existing product range and open whole new horizons of limitless possibilities. Development in Microprocessor technology changed the way we look at Computing devices today and we have seen a similar impact of OLED technology and its usage in Mobile communication devices. Going ahead from thinner display devices, we are moving to display that can be printed from an inkjet printer (Pardo 2000).

A discovery of new material property, which is lighter in weight but stronger in use and more versatile, may open newer avenues of usage rendering the existing material to be relatively obsolete. While the invention of Plastics opened a whole new world of possibilities. Similarly, the recent discoveries in the field of Self-healing materials are opening new avenues of applications through research (Zang 2008).

3.2.2 People / User (Social)

Number of patent registrations, that are not been put to use, indicate that although the scientific finding or capability might be there, it is what people truly *need*, that defines the application potential. Papanek (1984) emphasized on designing for people's needs rather than their wants. Social relevance, contribution and cultural influence can play a major role in rethinking about the products of future. Margolin (2002) highlighted the designer's ability to envision products that have *social relevance* and address *social problems* on a broader scale. The products of tomorrow need to be more *inclusive* to serve larger segments of society and yet derive from ethos of culture for effective lasting experience. It is imperative for a designer to study how the user lives his life, to design a product that has better acceptability due to emotional involvement alongside better function.

While Prabhakar (2010) believed that social variables affect the behavior of other variables in the areas of economic, technological, demographic and ecological forecasts, some researchers like Kristen Day (2000) have observed great importance of Socio-cultural factors too. "*The key aspects of culture, such as cultural group history and life experiences, assets, beliefs and values, care-giving practices, activities and preferences, are considered while designing for people.*" (Day 2000)

3.2.3 Environment

Lastly, the whole debate of Sustainability has led us to reassert the sustenance of the product for longer life and value the relationship with environment and ecosystem. Life Cycle Assessment (LCA) has enabled us take a step back into foreseeing the end-of-life impact of our products. This inspired researchers like

McDonough (2001) to come up with new compelling theories such as Cradle-to-cradle framework to foresee and make our products more sustainable.

4. DESIGN TRIPOD

Thus, the Future of Product design stands on 3 broad paradigms: **-Technology, People and Environment**. An imbalance of one may cause an impact on longevity of the product.

- ❖ **Technology Paradigm:** Materials, technology, manufacturing
- ❖ **People- Social Paradigm :** People / User, Society, Culture
- ❖ **Environment Paradigm :** Sustenance, relationship with environment, Post life impact

4.1 Future Methods for Design

While deciding upon relevant future mapping methods for design for future, it is imperative to look at future assessment in view of the above mentioned factors. Future thinking can no longer be confined to data crunching and trend analysis only. While there are specific methods which cater to future mapping below mentioned individual factors, what is required for design forecasting is a framework to create a comprehensive blend. It is important to study and future map these factors together for a more summative and comprehensive overview for future design research.

Table 3. Design paradigms, along with existing future mapping methods

	Paradigms	Future mapping methods (Forecasting techniques)
1	Technology	
	Materials	Delphi panel, Technology forecasting methods, Bibliometric
	Technology / Scientific principle	Bibliometric & Scientometric Analysis, Trend Analysis, TF methods
	Manufacturing	Technology Forecasting methods, Patent analysis
2	People-Social	
	People / User	Delphi panel, Interviews, brain storming, scenarios
	Society	Delphi panel, interviews, brain storming, scenarios, Causal models
	Culture	Delphi panel, brain storming, causal models
3	Environment	
	Sustenance	Impact analysis, LCA
	Symbiosis with environment	Impact analysis, intermittent LCA, panel experts
	Post life impact	Sustainability analysis, LCA

Note: Although many of the forecasting techniques proposed above are speculative and are simply proposed because of their inherent strengths, the important observation is the underlying importance of carrying out forecasting for all the paradigms in coherence in Design Forecasting.

For example, while undertaking design forecasting for a product, evolving needs of the people and changing nature of the society are important, but the latest progresses in the field of other allied areas such as technology, materials, as well as the future impact of the product on its ecosystem and environment can not be ignored either.

5. GAPS AND OPPORTUNITIES

5.1 Limitations of Existing Future Mapping Techniques with Reference to Design Forecasting

A) Dynamic fast changing world, parameters, requirements and benchmarks

World is changing rapidly and in this premise of increasing uncertainty for the future, it is all the more important to develop an approach which is more holistic and justified in tapping these advances in parallel and their cognizance to each other.

B) Linear singular-objective approach of existing forecasting techniques

Many of the current forecasting techniques have a linear singular-objective oriented approach. Inherently relying upon existing data and adherence to previous trends is a narrow proposition and is limiting our vision.

C) Current forecasting techniques are good for short-sighted immediate future

Current forecasting and future mapping techniques do not support visions over longer horizons.

D) Current future mapping techniques have a focussed but very limited approach

Outcomes of forecasting techniques are **not holistic** as they very often fail to acknowledge and thus, overlook developments in other fields that could possibly impact the course of things.

E) Impact over social, culture and environment need to be acknowledged and registered

Although designers have been persistent in envisaging the impact of the product on individual and social level but the effort is isolated and only confined to a limited scope.

F) Design forecasting deals with the products for future that are directly related to people's aspirations and thus, supported by people through marketing and sales. Thus, design research methods for future mapping must hold people / user's needs and aspirations as pivotal.

5.2 Importance of Future Mapping for Design Education

Design education primarily focuses on teaching young students how to solve design problems with i) defined set of parameters and objectives; and ii) problems in which parameters are not yet defined. While approaches like *Scenario building* work well for problems of second type, *Trend mapping* help for the first type. But Design forecasting that stands up on three parallel paradigms provides a solid platform for the designers to perform on both set of design problems and thus, come up with a wholesome tool to look at future from a wider perspective and consider social, cultural and environmental paradigm also, alongside technology.

6. CONCLUSION

Trend predictions contribute to the creative process of design, trying to make future visions more plausible. As Evans (2003) claimed – *"They assist in helping the viewer to undertake a leap of faith and believe that the future may be radically different to the world of today"*. Having a clear vision, enables designers to prepare and gradually move the current generation of products into the direction of future through clear focus and deliberation. Evans (2003) identified trend forecasting to be an integral part of design process – *'The notion of what the future holds is often central to design process. In essence, it is part of the design process, intertwined with form, function, usability, suitability, sustainability, manufacturability, desirability, and the many, many other considerations designers address'*.

Woudhuysen (1992) identified forecasting as a *'periscope to future'* but also expressed his apprehension over lack of any concrete forecasting technique good enough to suffice *'...its pioneering stuff. There are no route maps for what we are trying to do, and we are probably doing half of it wrong'*. But perhaps the pessimism comes from the reliance over a singular future mapping approach.

There are several approaches to derive forecasts but no single approach is sufficient enough. A combination of several approaches make vision clearer and less abstract. Although the level of abstraction depends upon the timescale of the prediction, the further we look into the future- the forecast becomes more abstract and conceptual. Thus, creative thinking approaches such as stories and scenarios are commonly used for long-term predictions.

One of the key findings identified in this study is the multi-disciplinary approach required in design research methods for future. Future mapping activities include not only the valued input of designers, but also a selection of perspectives from experts from various backgrounds. While a designer's usual strength lies in comprehension and synthesis of visual information, they are able to visually represent the results and 'vision' for easy understanding. Other activities such as statistics, ethnographic research, trend analysis, socio-economic data analysis, etc. require different set of skills. A combined effort of this multi-disciplinary team is needed to envision and articulate all of the nuances and information involved.

Although future mapping is already seeing convergence in various businesses, the depth and extent seem limited due to approach, focus and clear methodology. Thus, there is a felt need to find a more unified and holistic approach which embodies these factors and concerns paving path towards a clearer vision.

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