A Graphical Method for Exploring the Business Environment

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Abstract

Purpose:

> This paper describes a straight-forward method for drawing pictures that may be used to elicit, explain, document and communicate the external business environment. This easily-learnt drawing convention helps business strategists identify and focus on the key components of the external business environment.

Design / Methodology / Approach:

> This is a technical paper describing a 'method' or 'procedure' for constructing a semi-formal graphical representation of the business environment. The paper is structured around a specific case-study of the representation of the business environment prevalent for the automotive industry.

Findings:

> This paper includes three major results (1) An explanation of the drawing method itself (2) Its application to a specific case-study and (3) An analytical treatment of the diagram using a method adapted from Complex Systems Analysis that enables deeper insight and engagement with business environment under consideration.

Practical Implications:

> There are three practical implications of this paper:
>
> 1. It provides a readily usable and easy-to-learn method that can be applied immediately by business strategists.
> 2. It demonstrates that semi-formal graphical methods may be usefully applied in this domain.
> 3. It shows that the analytical methods of Complex Systems may be applied to those representations to obtain deeper insights into the information.

Originality / Value:

> This papers originality lies in addressing key weaknesses in an almost ubiquitous tool of business environmental scanning - PESTLE Analysis. These improvements are associated first with understanding and documenting the important relationships and implications of the various PESTLE elements as they apply to a specific business.

Key Words:

> PESTLE, Business environment, Graphical, Mapping, Model

Classification of paper:

> Technical Paper

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1 Introduction

It has been argued that when considering the present or future business environment it is not enough simply to identify its key features. Rather, the analyst (often a business strategist) needs to engage in a deep manner with the subject under consideration.

> *"The better we can understand the cause-and-effect associations between the things shaping our business and its markets, the better placed are we to make strategic decisions to ensure effective future performance…In carrying out a PEST or PESTLE analysis it is all too easy to produce lists of factors, many of which may be of little or no importance in developing strategy…Developing a clear understanding of the cause-and-effect relationships between the factors in the PESTLE model is more challenging"*

> *Tovstiga and Aylward (2008)*

In considering future scenarios Wack (1985) has argued:

> *"Good scenarios are not enough. To be effective, they must involve top and middle managers in understanding the changing business environment more intimately than they would in the traditional planning process… Quite simply, [the scenarios] needed structuring…The first-generation scenarios presented the raw uncertainties but they offered no basis on which managers could exercise their judgment."*

Indeed, in the original work in which PEST analysis was introduced, Aguilar made explicit the structured nature of the Business Environment Scanning Task (Aguilar, 1967); that is, that there is logic of causal relationships as follows:
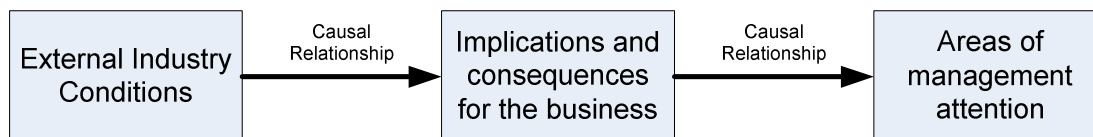

Figure 1 : Aguilar's Causal Relationships between External Industry Conditions and Areas of Management Attention

It is thus perhaps surprising that although PEST / PESTLE analysis is introduced as a key tool for prompting consideration of aspects of the external business environment at all levels of business education, it is frequently presented as a mechanistic, 'key-word' driven analysis tool. Thus, it is employed as a handy mnemonic device, leading to a regular, tabular and consequentially formulaic documentation of issues external to the business. It may be made richer through the application of standard questions, or prompts (See Appendix A) but this almost invariably leads to a uni-dimensional analysis. Such an output does not allow the expression of causal relationships between individual environmental issues, and from those issues to the implications for the business.

We thus suggest that a more powerful analytical tool, based on the PESTLE tool, might be developed, with the following desirable properties:

- To better enable us to understand the cause-and-effect associations between the things shaping our business and its markets

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- To enable threads of causal relationships to be made explicit to enable more intimate understanding the changing business environment

- To provide a 'tool for thinking' that enables deep engagement with the subject matter and reasoning about the causes and consequences

In looking for a solution that addresses these desirable properties it is natural to consider a graphical interpretation of PESTLE analysis. In that context we can consider the Tversky's argument:

> *"Graphics have an advantage over language in expressiveness; graphics use elements and relations in graphic space to convey elements and relations in real or metaphoric space. As such, they allow inference based on the visuospatial processing that people have become expert in as part of their everyday interactions with space. As cognitive tools, graphics facilitate reasoning, both by externalising, thus by offloading memory and processing, and by mapping abstract reasoning into spatial comparisons and transformations. Graphics organise and schematize spatial and abstract information to highlight and focus the essential information. Like language, graphics serve to convey spatial and abstract concepts to others. They make private thoughts public to a community that can then use and revise those concepts collaboratively"*

(Tversky, 2005)

Thus in the next section we introduce a diagrammatic convention aimed specifically at modelling the business environment and which addresses these issues. We have named this convention 'PESTLEWeb^{TM}'.

We further show an example of how such a diagrammatic representation of the business environment once available, can be treated with 'transformational' analytic tools enabling deeper reasoning and insight into the environment under consideration.

2 PESTLEWeb^{TM}

2.1 Drawing Conventions

At its core PESTLEWeb^{TM} is based on the ubiquitous PESTLE tool that is used to support the identification of Political, Economic, Social, Technological, Legal and Ecological issues in the business environment. However, PESTLEWeb^{TM} is a drawing convention rather than a tabulated, textual analysis.

The base elements of the PESTLEWeb^{TM} are a series of boxes labelled to represent each element of the PESTLE analysis. These boxes may be coloured in order to aid identification and differentiation. Those base elements are then joined with directed lines representing the causal relationships between elements.
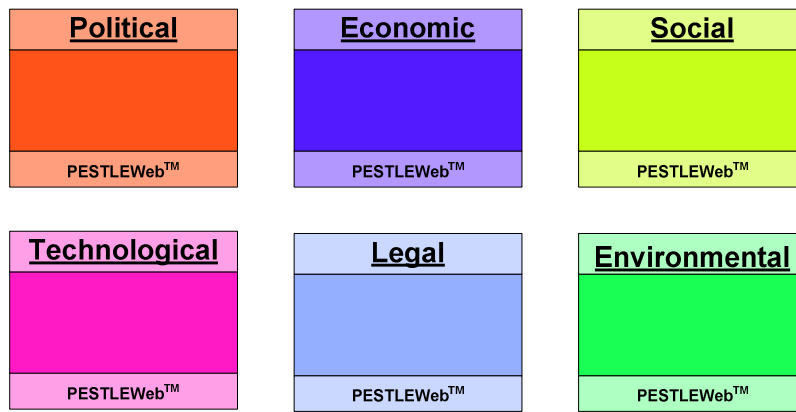
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Figure 2 : The Core Elements of the PESTLEWeb^{TM} Drawing Convention

In order to be useful for analysis, as well as representing PESTLE issues and their causal relationships it is also important to be able to identify the logical consequences of those causal relationships. This is particularly true because to be productive we need analyst to move from an abstract analysis of the business environment to the specific consequences that impinge on their own business.

Additionally, it is a common convention in the more formal diagrams of Software Engineering to include drawing elements that enable annotation and comments. Such elements may sit apart from the formal 'modeling' (representational) elements of the diagram, but they do afford the human reader to better understand the diagrams. Within the PESTLEWeb^{TM} notation we include a generic 'comment' symbol, and a specific variant of a comment used to indicate source references for further information. The latter symbol enables the diagram to be embedded within a richer network of source information.
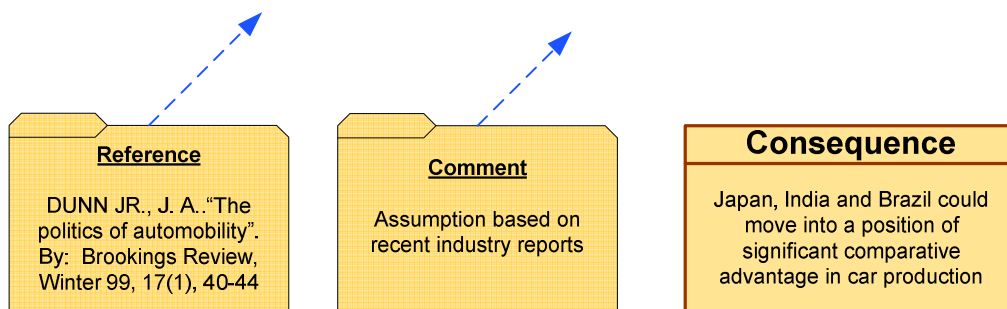
Figure 3 : Reference, Comment and Consequence Elements of the PESTLEWeb^{TM} Drawing Convention

Finally, the convention includes an element to annotate relationships between elements that are not causal in nature. These elements are intended to be less 'powerful' in the PESTLEWeb^{TM} model that the causal relationship element identified above. Rather than expressing a consequential logic they represent a more generic association between elements. These two types of connectivity between elements (causal and relational) have previously been shown to be

useful in a similar context in a previous diagrammatic notation introduced by the author (Collins 1997a ; 1997b)

Consider, for example, Figure 4 that shows two elements from a PESTLEWeb[TM] analysis of the automotive industry. The two issues in the diagram are not causally related, but there is an important relationship, or association that the analyst wants to emphasize in the model. This association may be implicit, or the joining line may be labeled explicitly with the nature of the association. Such associations may also be annotated with Comment elements (noting however that comments do not form part of the formal 'model' for analytical or 'transformational' purposes).
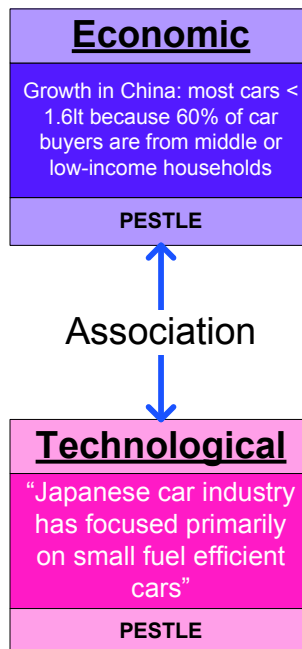
Figure 4 : Illustration of the use of a Generic Association between Elements in a PESTLEWeb[TM] Diagram

2.2 A PESTLEWeb[TM] Model for the Automotive Industry

2.2.1 Starting the Model

This section illustrates the development of a PESTLEWeb[TM] model for the Automotive industry, showing how the model is built section by section. Figure 5 shows an extract from the full model. This shows the consequential chain that leads from car pollution and congestion, through the social and economic consequences of that pollution and on to the political response to those social and economic issues. Note that some of these consequences are economic and some are technological.

Environmental — Pollution from operation and production of cars — PESTLEWeb™

Economic — 'Externalities' - Pollution cost does not fall to the user. — PESTLEWeb™

Political — Introduction of Carbon Tax and Carbon Trading — PESTLEWeb™

Environmental — Congestion — PESTLEWeb™

Social — Growing public awareness of green issues. — PESTLEWeb™

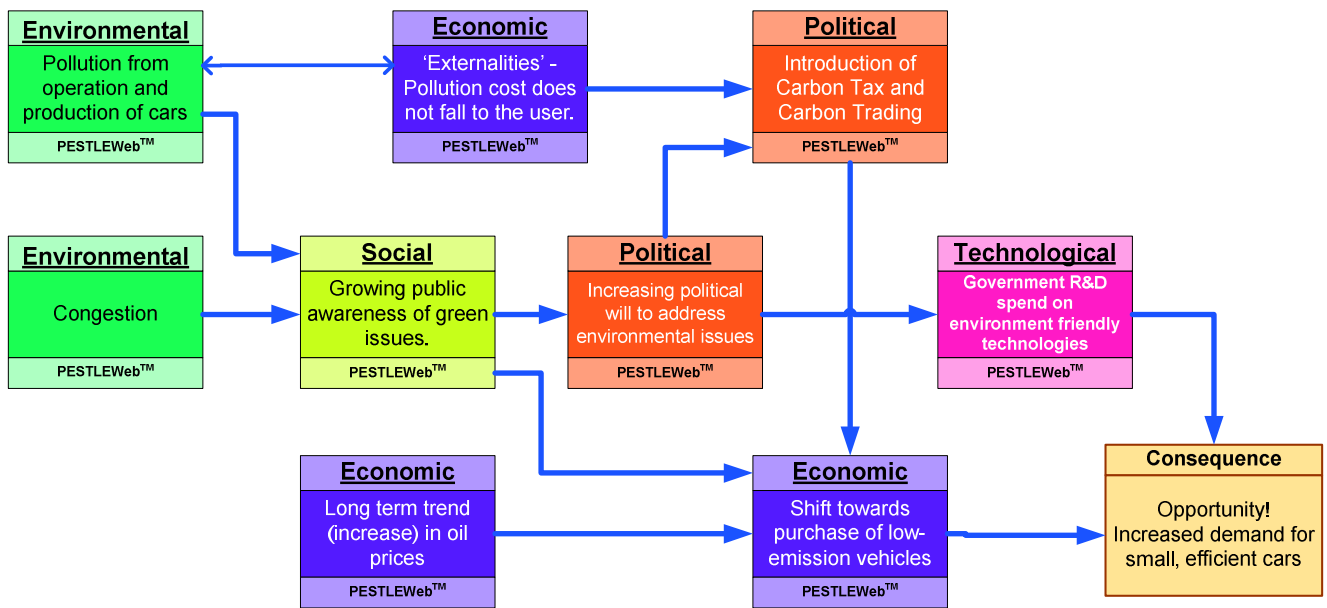**Political** — Increasing political will to address environmental issues — PESTLEWeb™

Technological — Government R&D spend on environment friendly technologies — PESTLEWeb™

Economic — Long term trend (increase) in oil prices — PESTLEWeb™

Economic — Shift towards purchase of low-emission vehicles — PESTLEWeb™

Consequence — Opportunity! Increased demand for small, efficient cars

Figure 5 : Part 1 of a PESTLEWeb™ Diagram for the Global Automotive Industry

At the bottom right-hand side of Figure 5 we see the final consequence for a specific business that emerges from this causal logic chain. This consequence, of course, would be different depending on the circumstances of the particular business; for an automobile manufacturer producing large, 'gas-guzzling' cars, the consequence might be a significant threat. In this example, we have shown the opportunity that may arise for a manufacturer of smaller, fuel-efficient engines.
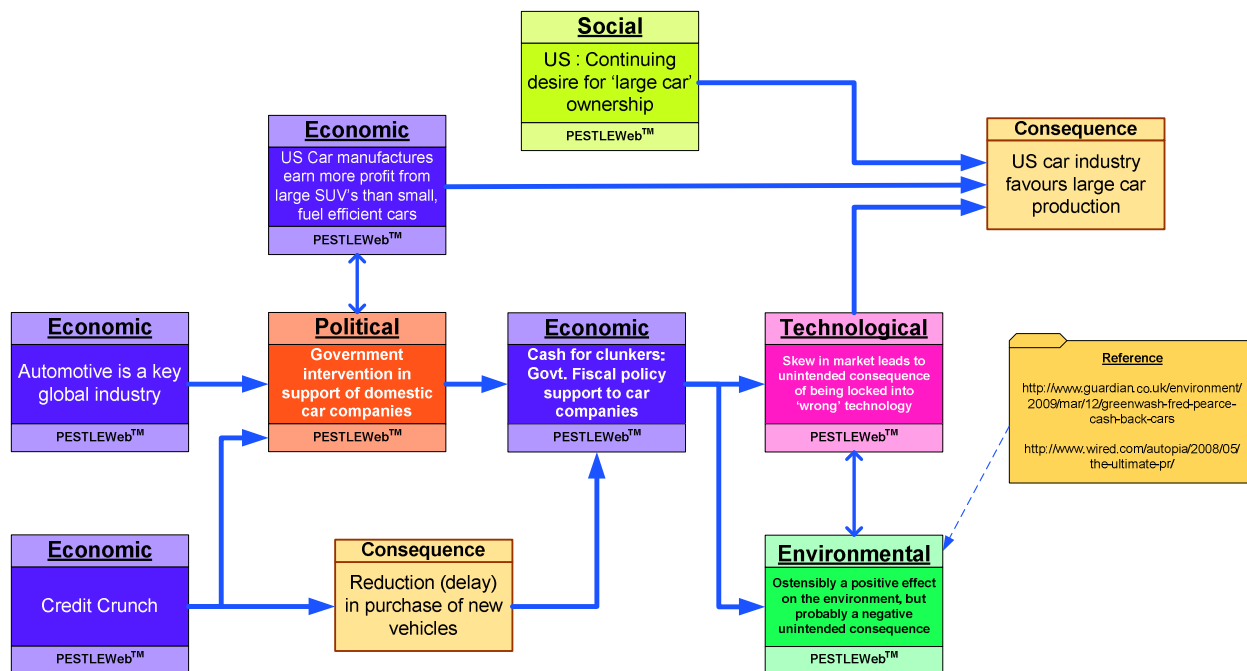
2.2.2 Considering Consequences

Social — US : Continuing desire for 'large car' ownership — PESTLEWeb™

Economic — US Car manufactures earn more profit from large SUV's than small, fuel efficient cars — PESTLEWeb™

Consequence — US car industry favours large car production

Economic — Automotive is a key global industry — PESTLEWeb™

Political — Government intervention in support of domestic car companies — PESTLEWeb™

Economic — Cash for clunkers: Govt. Fiscal policy support to car companies — PESTLEWeb™

Technological — Skew in market leads to unintended consequence of being locked into 'wrong' technology — PESTLEWeb™

Reference — http://www.guardian.co.uk/environment/2009/mar/12/greenwash-fred-pearce-cash-back-cars — http://www.wired.com/autopia/2008/05/the-ultimate-pr/

Economic — Credit Crunch — PESTLEWeb™

Consequence — Reduction (delay) in purchase of new vehicles

Environmental — Ostensibly a positive effect on the environment, but probably a negative unintended consequence — PESTLEWeb™

Figure 6 : Part 2 of a PESTLEWeb™ Diagram for the Global Automotive Industry

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In Figure 6 we see the development a section of the Automotive PESTLEWeb^{TM} model that brings together issues of:

- The recent credit crisis and its political and hence economic ramifications for the car industry

- Social, Economic and Technological factors leading to the US car industry being strongly weighted towards 'large-car' manufacture, and

- Issues of 'unintended consequence' of government support of existing manufacturers

One aspect of this diagram should be highlighted to illustrate a general point about PESTLEWeb^{TM} models. The 'Consequence' element labelled "Reduction (delay) in purchase of new vehicles" could be considered a generic "Economic" issue rather than a "Consequence"; why is it thus so labelled?

The answer is that the "Consequence" elements are the link between the general analysis of the Business Environment, and the immediate consequences for the specific business for which the analysis is being performed. In a pure "Industry Analysis" this element might well be labelled as generic "Economic" node. However, in this case we are developing the model from the position of a business that can foresee immediate consequences and implications for their business.

In general the "Consequence" elements will feed most directly into later stages of strategic analysis for the business. They will often appear as the 'Opportunities' and 'Threats' in a later SWOT[1] analysis.

2.2.3 Threads

'Threads' are series of causally related issues that run through the model. These can be considered as the 'stories' that run through the analysis. In other words, each of the PESTLEWeb^{TM} elements should be regarded neither as 'atomic' nor simply connected to its precursors and consequences. Rather, analysts need to consider 'threads' of causally related issues in order to develop a deep understanding of the business environment. Such PESTLEWeb^{TM} threads are a close analogue to those introduced by Collins (2000) and are used to explain and analyse behaviour in large-scale, complex systems.

The section of the Automotive Industry PESTLEWeb^{TM} model in Figure 7 introduces issues associated with the emerging economies and bias in certain countries towards specific types of vehicle. In the full, integrated model elements from this thread cross-linked to elements in the previous threads.

The concept of threads is useful in this context because they enable coherent themes to be drawn from the interconnected network of model elements.

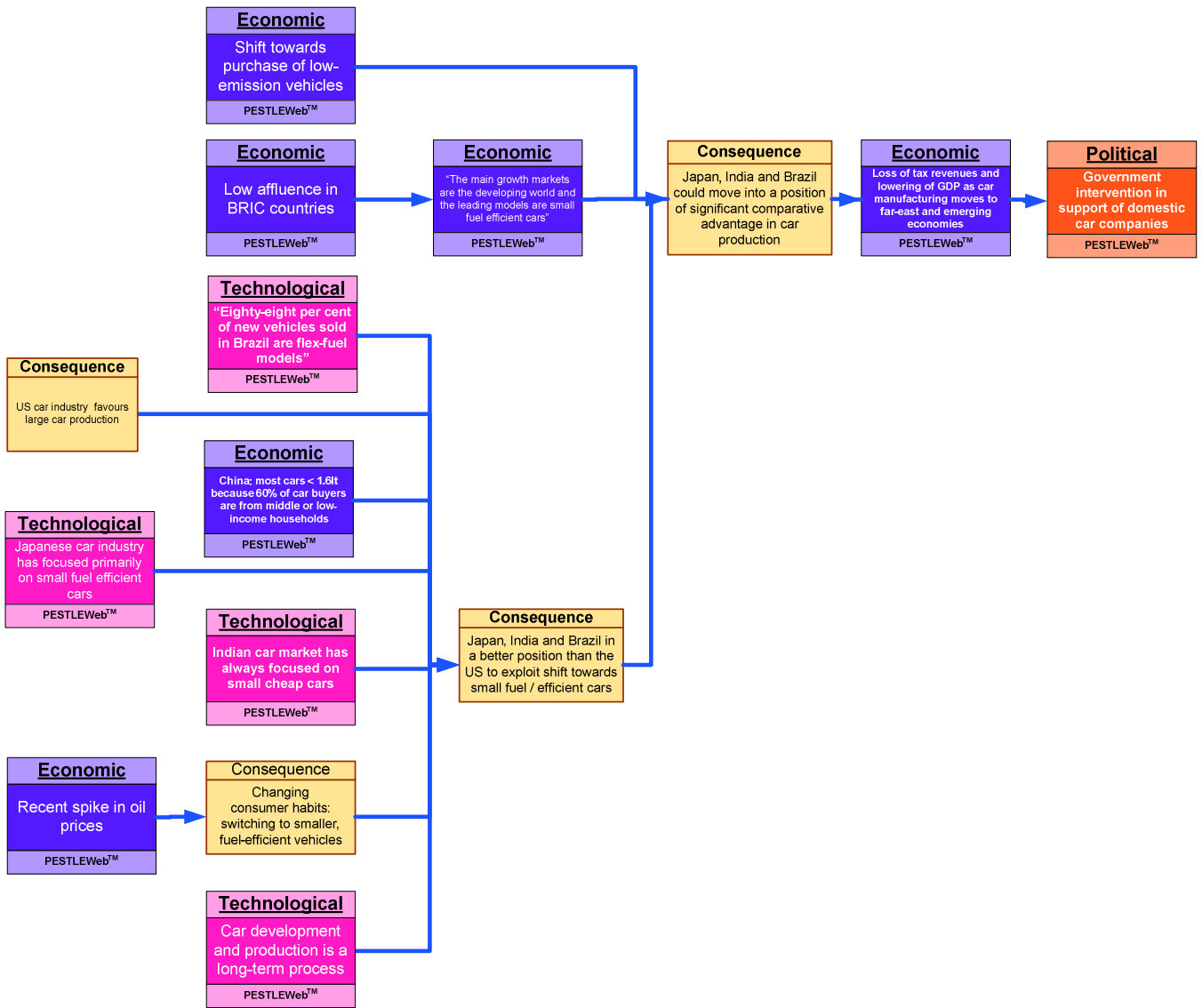[1] SWOT : Strengths, Weaknesses, Opportunities and Threats

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Economic
Shift towards purchase of low-emission vehicles

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Economic
Low affluence in BRIC countries

PESTLEWeb™

Economic
"The main growth markets are the developing world and the leading models are small fuel efficient cars"

PESTLEWeb™

Consequence
Japan, India and Brazil could move into a position of significant comparative advantage in car production

Economic
Loss of tax revenues and lowering of GDP as car manufacturing moves to far-east and emerging economies

PESTLEWeb™

Political
Government intervention in support of domestic car companies

PESTLEWeb™

Technological
"Eighty-eight per cent of new vehicles sold in Brazil are flex-fuel models"

PESTLEWeb™

Consequence
US car industry favours large car production

Economic
China: most cars < 1.6lt because 60% of car buyers are from middle or low-income households

PESTLEWeb™

Technological
Japanese car industry has focused primarily on small fuel efficient cars

PESTLEWeb™

Technological
Indian car market has always focused on small cheap cars

PESTLEWeb™

Consequence
Japan, India and Brazil in a better position than the US to exploit shift towards small fuel / efficient cars

Economic
Recent spike in oil prices

PESTLEWeb™

Consequence
Changing consumer habits: switching to smaller, fuel-efficient vehicles

Technological
Car development and production is a long-term process

PESTLEWeb™

Figure 7 : Part 3 of a PESTLEWeb™ Diagram for the Global Automotive Industry

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3 Transforming PESTLEWeb^{TM} Models for Deeper Analysis

3.1 Guide-Word Driven Exploration

Evidence from threads analysis in complex systems environments suggests that is it useful to highlight elements and threads and to apply systematic 'transformations' on them Collins (2000). Such transformation enable deep intellectual engagement with the subject matter and reveals patterns that would not otherwise be evident.

For example, 'deep' analysis is afforded through the application of systematic "what if" questions applied to elements within a thread:

- What if this issue increased in severity?

- What if this issue was reversed in effect?

- What if this issue disappeared or became inconsequential?

The cognitive overhead associated with addressing such specific 'what-if' questions is less than simply asking general questions (E.g. "What is wrong with this diagram" or "What does this diagram tell us?". In other words, when prompted with specific what-if questions people are more likely to view material from a new and illuminating perspective.

"Aha!" moments are not uncommon as analysts change their perspective on the subject matter. They are able to engage more deeply with each element and thread in the context of a specific what-if question. This context is essentially a hypothesis that the analyst can use to challenge the validity (or otherwise) of the specific case.

In particular, the analysts looks for possible causes, consequences and implications for the hypothesis being considered.

A straight-forward mechanism for developing such directed what-if questions is to use the 'HAZOP' technique (Storey, 1996). This technique uses generic guide-words and specific interpretations in the context of specific model element types. Guidewords are fairly universal in different modelling contexts, with only small adaptation to a specific interpretation in a particular context.

An example list of guidewords and interpretations in the PESTLEWeb^{TM} context are provided in Table 1.

This results of this type of systematic analysis are normally tabulated along within information including:

1. Possible cause
2. Possible consequence
3. Probability of occurrence
4. Severity of Effect

Table 2 provides a small example of the proposed PESTLEWeb^{TM} guide-word driven cause-consequence analysis. Note that as well as prompting insights and deep consideration of the model, its tabular structure enables straight-forward summaries to be developed, for example, the sorting of particular cases by their likelihood and business consequence (i.e. Risk and Opportunities).

The structure of the PESTLEWeb^{TM} model should itself address some aspects of (1) and (2) above, since it shows threads of causally related issues. However, it is likely that in the course of this analysis, new PESTLE issues will be surfaced that can be added to the model.

A negative aspect of such an analysis is that it can become large and effortful to produce. However, in practice it is relatively easy to focus on specific, key issues.

The analysis may be conducted either by an individual or as a group activity. Both modes have advantages but it is generally considered that analysis as a group activity is most productive in generating new ideas and insights.

Guide Word	*Interpretation*	*Example for a 'Technology' Element*
Earlier	What would be the situation if this issue arose earlier?	Technology becomes available more quickly than expected
Later	What would be the situation if this issue arose later?	Technology becomes available more slowly than expected
Not	What would be the situation if this issue did not occur, or was negated?	Technology is not available
Worse	What would be the situation if this issue had a more negative consequence than expected?	Less effective technology; technology does not achieve the expected results
Better	What would be the situation if this issue had a more positive consequence than expected?	More effective technology; technology achieves better results than expected
Other	What would be the situation if some other aspect of this issue were the case?	Disruptive innovation makes this technology issue

Table 1 : Guide Words used to Systematically Explore PESTLEWeb^{TM} Elements

PESTLEWeb Cause - Consequence Analysis

Diagram under Anlaysis	Automotive Industry model
Analyst	Rob Collins
Date	14th March 2010

Item	Description	Guide Word	Transformation	Probability	Cause	Consequence	Business Implication	Implication Score
1		Earlier	Cap limits fall sooner than expected	Medium	1. Growing public concern of environmental issues 2. Goverement concern about oil prices and energy independence	Increased market for low emmision technology, and technology to 'scrub' emmisions.	Decreased market demand for our clean engines. Break even cost for clean enginers higher as it is offset against carbon cap cost	+5
2	[Poltical] Introduction of carbon emmision trading	Later	Cap limits falls later than expected	High	Recession causes governements to 'go soft' on carbon caps	Reduced market for low emmision technology, and technology to 'scrub' emmisions.	Increased market demand for our clean engines. Break even cost for clean enginers lower as it is offset less against carbon cap cost	-5
3		Not	Carbon caps and trading abandonded	Very low	1. Emergence of disruptive technology that provides large amounts of cheap, clean energy (E.g. Fusion)	Catastrophic loss of market for other clean technologies	Catastrophic loss of current business. Therefore need to continually scan for emerging disruptive technologies in energy production	-10
4					2. Political will drains away from ecological issues	Market reduces but remains to some extend due to public concerns. Market more driven by energy price	Some loss of market. Ensure tracking of political status. Use loggying to support 'green' awareness	-6
5		Worse	Carbon trading does not function as expected. Cap regime circumvented	Low	Industry discovers that avoidance is cheaper / easier than compliance	Loss of confidence in emmisions trading Reduced market for low emmision technology, and technology to 'scrub' emmisions.	Some loss of market. Consider investing and supporting emmision compliance regime - technology, services, training and public awareness	-4
6		Better	Carbon trading functions much better than expected.	Medium	Carbon emmisions drop much more quickly than expected, because of economic driving effect of trading	1. Increased market for our products	Decreased market demand for our clean engines.	-4
7						2. Other solutions become cost effective hence increasing competition	increased competition from new entrants	-4
8		Other	Same eriect, different cause. Carbon emmisions are lower through some other mechanism	Medium	1. Emergence of disruptive technology that provides some level of clean energy (E.g. Solar /. Wind)	Not necessarily a threat. Could increase market awareness of issues. Part of a growing market.	Need to maintain market share against direct and indirect competitors. Monitor product life-cycle stage.	0

Table 2 : Example Cause - Consequence Analysis for one Element of the Automotive PESTLEWeb™ model

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3.2 Scanning the Business Environment

The results of the analysis described in section 3.1 may be usefully summarised in a variety of ways. One objective of such summary data should be to direct the analyst towards those issues in the environment that represent significant threats or opportunities.

The assessment of probability and impact in numerical terms (as shown previously) provides the opportunity to produce a scatter plot of the results. Figure 8 shows an example summary scatter plot of a complete cause-consequence analysis for the Automotive Industry example. Such a graphic enables the analyst to focus on the high probability events (points to the right of the plot) and those issues that have a large positive or negative impact on the business (Top-right and bottom-right respectively).

The colour coding of this graphic matches that of the original PESTLEWeb^{TM} diagram and is intended to enable the analyst to easily build a mental model of where the major threats and opportunities exist in the business environment.

Figure 8 simulates an analyst using a customised graphing tool to 'drill-down' into data supporting the scatter chart; In this case the pop-up information bubble provides details for the specific issue being highlighted.

A key use of Figure 8 is that it enables the analyst and/or business manager to focus on important aspects of the environment. This in turn is intended to direct scanning of the business environment, focussing attention on key information from a 'noisy' background.

It is this final step then than comes full circle and achieves the ends originally set out by Aguilar's 1967 text and which is illustrated in Figure 1.
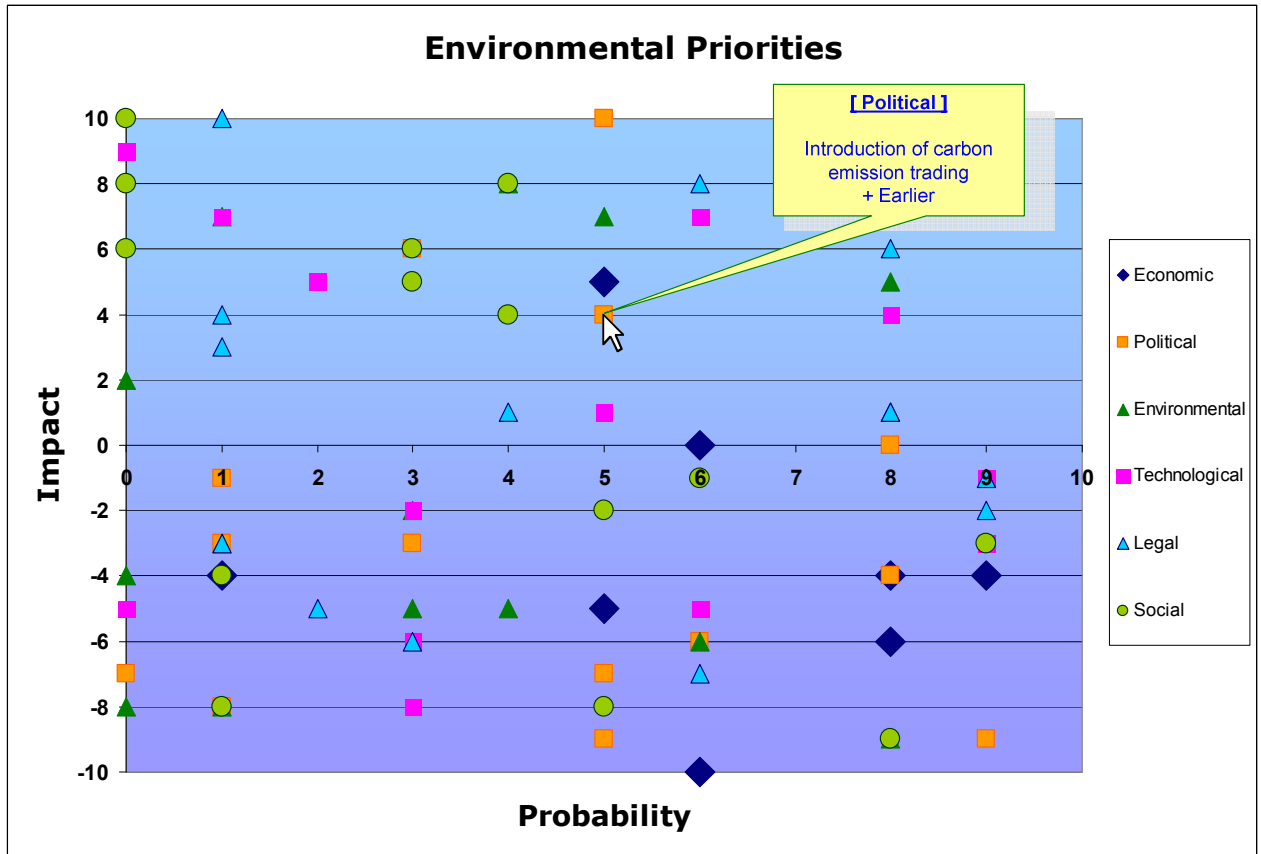
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Figure 8 : Scatter Plot of Results from Complete PESTLEWeb^{TM} Cause-Consequence Analysis

4 PESTELWeb^{TM} Conclusion

We have introduced PESTLEWeb^{TM} a new, diagrammatic tool for eliciting, exploring, explaining and documenting the logic of the current and future business environment. We have argued that a PESTLEWeb^{TM} model is a powerful 'tool for thinking' that addresses each of the desirable properties of section 0. Firstly, the cause-and-effect relationships between issues in the business environment are made explicit within PESTLEWeb^{TM} models. This thus overcomes one of the major limitations of existing PESTLE analysis.

Secondly we have provided some examples of the way in which PESTLEWeb^{TM} threads can be identified and documented. We have shown how the relationships between the business environment and a specific business under consideration can be documented. The argument here is that in documenting those relationships the analysts is driven to examine those relationships more rigorously.

We have shown that PESTLEWeb^{TM} models can be used as a 'tool for thinking' by systematically transforming elements with guide-word driven hypothesis to enable deeper engagement and greater insight. This is an analogue of well regarded methods of Systems Engineering and is intended to both challenge existing mind-sets and to suggest alternate realities and consequences

Finally, we have shown how the transformational analysis can be graphically summarised to enable easy identification of key focus areas for strategist and business executives when scanning the business environment.

The next stage of our work will be to test the PESTLEWeb^{TM} tool in the context of actual practice. We hope to build up an evidence base that the proposed tool is more effective and generative in mapping and promoting understanding of the business environment for strategy development.

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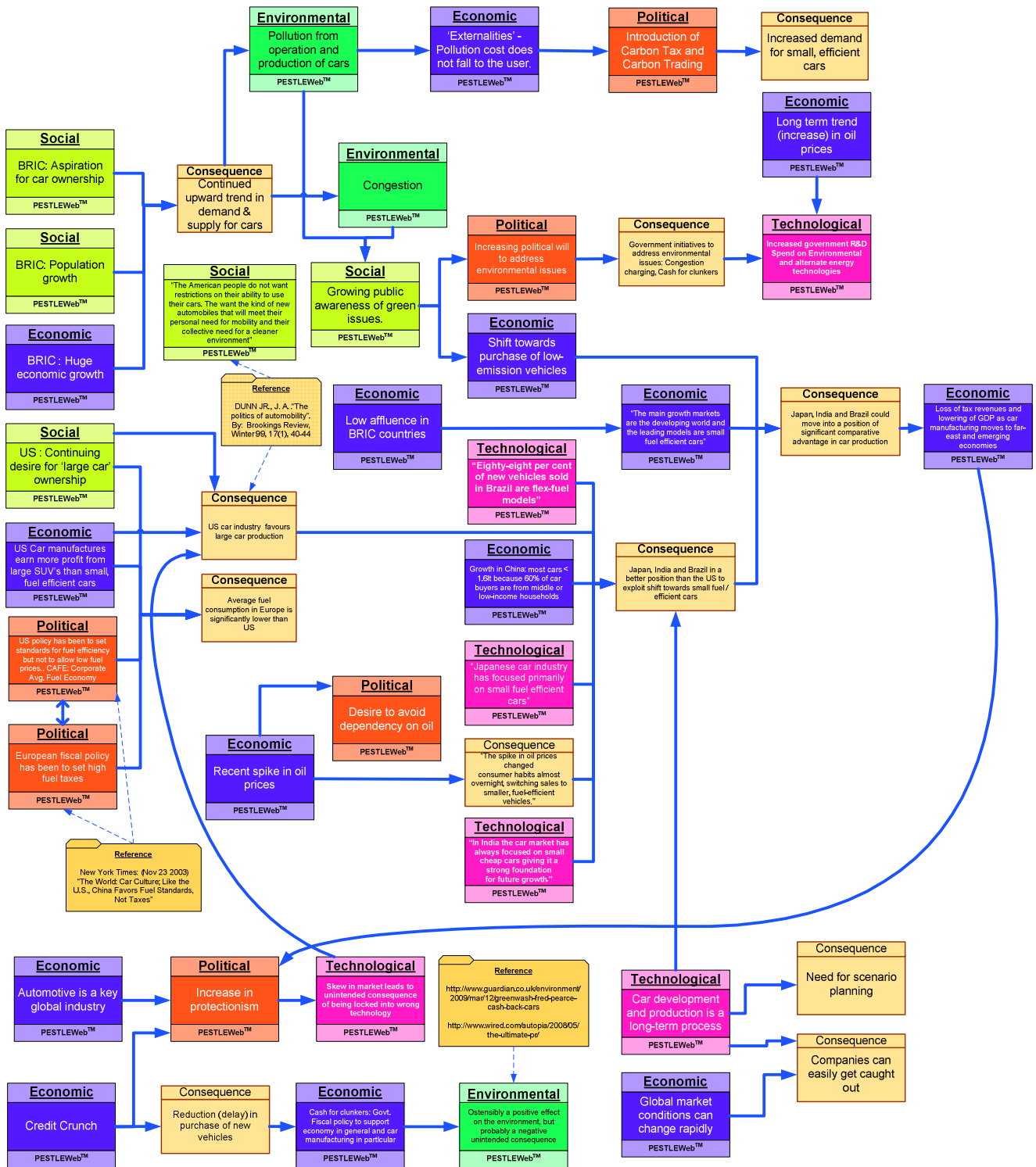
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Figure 9 : The Complete PESTLEWeb^{TM} Model for the Global Automotive Industry

Appendix A : Typical PEST Checklist
Political

- Political stability
- Risk of military invasion
- Legal framework for contract enforcement
- Intellectual property protection
- Trade regulations & tariffs
- Favored trading partners
- Anti-trust laws
- Pricing regulations
- Taxation - tax rates and incentives
- Work week

- Wage legislation - minimum wage and overtime
- Mandatory employee benefits
- Industrial safety regulations
- Product labeling requirements
- Ecological/environmental legislation
- Current legislation
- Future legislation
- International legislation

- Regulatory bodies and processes
- Government policies
- Government term and change
- Trading policies
- Funding, grants and initiatives
- Home market pressure groups
- International pressure groups
- Wars and conflicts

Economic

- Type of economic system in countries of operation
- Government intervention in the free market
- Comparative advantages of host country
- Exchange rates & stability of host country currency
- Efficiency of financial markets
- Infrastructure quality
- Skill level of workforce

- Labor costs Economic growth rate
- Discretionary income
- Unemployment rate
- Inflation rate
- Interest rates
- Home economy
- Economy trends
- Overseas economies
- General taxation
- Business cycle stage (e.g. Prosperity, recession, recovery)

- Taxation specific to product/services
- Seasonality issues
- Market/trade cycles
- Specific industry factors
- Market routes trends
- Distribution trends
- Customer/end-user drivers
- Interest/ exchange rates
- International trade and
- Monetary issues

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Social

- Demographics
- Class structure
- Education
- Culture (gender roles, etc.)
- Entrepreneurial spirit
- Attitudes (health, environmental consciousness, etc.)
- Leisure interests
- Lifestyle trends
- Demographics
- Consumer attitudes and opinions
- Media views
- Law changes affecting social factors
- Brand
- Consumer buying patterns
- Fashion and role models
- Major events and influences
- Buying access and trends
- Ethnic/religious factors
- Advertising and publicity
- Ethical issues

Technological

- Recent technological developments
- Technology's impact on product offering
- Impact on cost structure
- Impact on value chain structure
- Rate of technological diffusion
- Competing technology
- Research funding
- Associated and dependent technologies
- Replacement technology/solutions
- Maturity of technology
- Manufacturing maturity and capacity
- Information and communications
- Consumer buying
- Mechanisms/technology
- Technology legislation
- Innovation potential
- Technology access
- Licensing, patents
- Intellectual property issues

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