

Immaterialisation - the new reality

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Abstract. Among the anticipated benefits of an Information Society or a Networked Knowledge Society, the benefit to sustainability of less material intensive e-services and e-products has long been listed but little evidenced. Progressive gains in eco-efficiency (the so-called Dematerialisation of Production) have been, and continue to be, achieved, but the step-change improvements anticipated (the Immaterialisation of Consumption) have not (or, if they have, have not been recognised or accepted as such). As with the similarly anticipated productivity step-change, the figures seemed not to support the expectations. The ASSIST project addressed this 'stalled' topic of immaterialisation. The theoretical understanding of the topic was reviewed in depth, including sociological and economic theories of consumption, as was the place of Immaterialisation in theories of Sustainable Development. This culminated in a new paradigm of Immaterialisation as a 'switch', and a consequent new understanding of its operation and effect. This was tested against (limited) current examples and also short-term future scenarios, demonstrating its validity and workability. The outcome was a proposed 'Immaterialisation Action Plan' offering, for the first time, the ability to reinvigorate this stalled topic and deliver the long predicted benefits. This paper briefly summarises the new paradigm of Immaterialisation before identifying the implications for future research in e.g. 6FP in the synergistic triple alignment of technological, commercial, and sustainability imperatives.

1. Introduction

The concept of sustainable development has at its heart the consideration that many commonly accepted aspects of lifestyles in developed nations, are in fact not sustainable in the long run; constrained natural resources versus apparently unconstrained consumption or spoilage is not a contest that can be sustained for ever. It is not necessary to define or delineate the extent of the unsustainability with great precision: it is enough to be aware of the risk and to observe that much statistical data exists to evidence its reality¹. Sustainable lifestyles are those which consume less material resources; consumption in this context includes spoilage, waste and pollution.

Within this context, i.e. that environmental impacts are currently increasing unsustainability, it is quite clear that Information Society Technologies (ISTs) should offer, at the very least, some potential to facilitate lifestyles favouring sustainability and may ultimately, by the replacement of material consumption with virtual consumption, provide a major component of the solution to the sustainable development conundrum. There is accordingly a clear imperative to establish how best this might be achieved (and, as a corollary, how we might minimise any adverse effects of ISTs in this respect). The potential for sustainability benefits arising from ISTs has been much discussed, anticipated, doubted, and sometimes actually written off. The question 'how may ISTs best contribute to sustainability' is important not only for the furtherance of sustainability but also as a

shaping influence on the development of the Information Society itself. The answers are less simple than first thought but real potential does exist on a large scale. In particular, there are implications for research and development in ISTs; for the design and implementation of products and services, and for public policy. The ASSIST project set out to contribute to understanding in these areas by looking particularly at the topic of 'substitution' of ISTs for more material intensive goods and services: that is, the scope for 'virtualisation' or 'immaterialisation'. (This issue had originally been highlighted in the project ASIS in the ACTS programme which had identified the need for further investigation of the issues arising).

There has been for many years a well-established field of study, and increasingly a real and useable knowledge base, in the area of 'dematerialisation' or 'eco design' or 'eco-efficiency', where ISTs also have a part to play in the progressive reduction in the material content of goods and services. By aiding better design, and by facilitating more efficient use, ISTs have already contributed significantly to Dematerialisation.

Given this track record of success, it is no surprise that such little development of the topic of Immaterialisation as there had been prior to the ASSIST study had proceeded largely by analogy with Dematerialisation - that is, proceeding on a product-by-product basis; looking for direct substitution; and seeing lifestyle change (if at all) as a side effect.

ASSIST took a fresh look at the subject from the very beginning, starting from the underlying needs and values that influence such basic attributes of life as our consumption patterns and our modes of work. Relevant studies and theories in sustainable development; and a wide variety of socio-economic theories and theories of and about consumption (which, in general, had been derived without the benefit of any strong view of the future development of ISTs) were utilised in order to achieve a deeper and more appropriate understanding of IST led immaterialisation (the ASSIST core topic of 'substitution').

The ASSIST study creates the necessary deeper understanding of the subject to point the way to identifying an agenda within which the IST community can take pro-active measures to enable sustainable trajectories for development. It starts from theory and research, necessarily, but its main purpose, and its main outcome, is the formulation of a viable and justifiable action plan within which IST may be used to make the bridge between commercial imperatives and the imperatives of sustainability.

2. Reviewing Immaterialisation – The State-of-Art Survey

An essential of the ASSIST study is a clear distinction between two functionally different concepts

- Dematerialisation of Production
- Immaterialisation of Consumption

At first glance this seems to be a distinction only within the realm of economics but at a deeper level the distinction also identifies different key *actors* in the achievement of sustainability - narrow groupings of those involved in design production and distribution on one hand, and far wider groupings of consumers (i.e. almost all citizens) on the other. Above all else, this distinction indicates that 'Immaterialisation' involves aspects of the study of people and their behaviour, i.e. that it is essentially socio-economic. The first phase of the ASSIST study therefore looked particularly at its sociological and at economic aspects, beginning by surveying in some detail the various 'consumption theories' current in sociology.

The initial approach to sociological issues was based on the perception that there can be distinguished material needs and non-material needs; and that the satisficing of non-material needs (e.g. social needs in society) is frequently achieved by means of material

consumptions which are thus analogues or metaphors. In principle, where material consumption is itself a metaphor, ISTs should therefore be able provide an alternative metaphor that would be equally satisficing but less materially intensive or environmentally impact producing.

This 'needs and satisfiers' approach, heavily dependant on sociological concepts with little room for, e.g., evolutionary explanations for material status symbols, proved to be rather difficult to transmute directly into something of great practical use in the IST context, but its insights provided necessary elements of understanding in formulating a workable paradigm of immaterialisation.

What proves to be important in Immaterialisation is rather the totality of needs; chosen satisfiers; values, and behaviour that constitute a lifestyle; rather than any single specific need or satisfier or product. Immaterialisation is thus an aspect of the holistic approach advocated by, for instance, Max Neef and Doyal and Gough in current socio-economic thinking. Individual needs satisfied by individual consumption acts are, in consequence, of little relevance.

The holistic approach to needs (i.e. in the manner of Max Neef, Doyal and Goughⁱⁱ) encapsulates concepts of Quality of Life that are sometimes referred to as 'welfare' or 'caring' or 'well-being' and that are related to the achievement of health and happiness in the widest sense, and to aspirations for betterment that can only readily be accommodated within the broad framework of lifestyles per se.

In the process of coming to the summary understanding described above ASSIST undertook a very large survey of existing literature on the subject: primarily published academic work (176 different academic publications were reviewed) but also including 'grey' literature – non-academic books, political and polemic works, and a good quantity of current opinion on the consumer society, globalisation, large company marketing etc. Section 3.1 describes some main features of this survey. Notwithstanding the very wide range of sources, opinions, and styles of language, considerable areas of consensus do seem to exist: there is, however, no single substantial 'Theory of Consumption', but a whole set of theories concerning consumption expressed in the particular language of the academic discipline (or political viewpoint) concerned and, all too often, produced with total disregard (or even specific contempt in some cases) for other disciplines and viewpoints.

Economically the issues concerned were more straightforward: by considering which areas of economic activity were (or were not) susceptible to immaterialisation it was possible to arrive at a good (albeit broad) estimate of the potential for immaterialisation in economic terms. This economic assessment was, at first glance, a free-standing activity in that it assumed no change in culture or lifestyles, i.e. that it should be wholly constrained within the field of economics. This was not in practice a workable assumption: in fact, the assessment proved to be dependant on sociological questions to allow the formulation of a firm definition of immaterialisation and thus to distinguish those sectors susceptible to Immaterialisation from those sectors not susceptible.

In the specific context of an economic assessment of the potential for immaterialisation, notwithstanding the general prevalence of culturally conditioned satisfiers, the definition applied in assessing the economic potential of Immaterialisation, was such that the need being satisfied had to be wholly 'false' or immaterial: on this definition, 25% of all current consumption is available for immaterialisation, and this figure would rise to 50% as the increasing size of the global middle class shifts consumption patterns away from emphasis on the basic needs of poverty and towards the subtle and intricate absurdities of more sophisticated or 'advanced' economies. Immaterialisation is thus vitally important in developed nations today, but even more so in the developing world in the future.

3. A new understanding of Immaterialisation

A number of issues arising in the state-of-art survey of ASSIST combined to indicate the need for a re-definition, and indeed re-conceptualisation, of the meaning of Immaterialisation and, by extension, of its specific rebound effect, Rebound-I. Previous definitions had merely been imputed from the distinction between consumption and production, but without any more full development, so that the unhelpful practice had arisen of deriving all characteristics of Immaterialisation by analogy with Dematerialisation. Perhaps as a result, Immaterialisation was not widely understood nor was it accepted to be systematically different in kind from dematerialisation.

ASSIST therefore undertook a mid-term review leading to the production of a new definition of immaterialisation representing a significant development from the previous conception. In the new definition the emphasis falls on choice by the consumer: Immaterialisation is characterised by a 'switch' in consumption behaviour from more material to less material. This is a very general definition: within it, an important sub-class (perhaps the most important) is that of IST-led Immaterialisation. This new definition (arising from a new understanding, not a mere re-ordering of words) necessarily invoked a new definition of the rebound effect corresponding to Immaterialisation - now called Rebound-I to distinguish it from its counterpart in Dematerialisation, Rebound-D. The rebound definitions proved to correspond well to concepts in economics (Rebound-D is an own price substitution effect, whereas Rebound-I is an income effect).

This new understanding of Immaterialisation as a switch, combined with the substantial and convincing research evidence (from the state-of-art survey) that the 'satisfiers' between which the choice (switch) is made are culturally informed, leads inexorably to a view of Immaterialisation as being essentially a culturally informed choice; a decision made to change at least some aspect (or perhaps the entirety) of a lifestyle. The view of Immaterialisation as a function of lifestyle change is consistent with the demand side economic location of Immaterialisation as well as with its 'switch' definition but it modifies considerably the pre-ASSIST understanding of Immaterialisation as the simple substitution of a specific 'virtual' consumption for a specific 'real' consumption. Lifestyle change is an example of value-led behaviour change which is much influenced by the lifestyle experienced in early, formative, years (particularly the teenage years) and is in consequence a very long term issue. The direct substitution approach is problematic because of the generally indirect and/or complex nature of substitutions observed in practice. A virtual or immaterial substitute may satisfy some of the complex needs satisfied by its material predecessor - but in general it will also fail to satisfy others and will also satisfy some needs not addressed by its predecessor.

The main practical outcome of the new understanding of Immaterialisation as a function of lifestyle change is to move away from the single item (nearby) substitution approach (which is actually more appropriate to the Dematerialisation of Production concept of individual products) to a more aggregated approach based on an individual's patterns of consumption behaviour and deriving from their perceptions of values - i.e. moving away from resources and towards lifestyle issues. These are culturally determined, but it is important to observe that many different lifestyles may co-exist in a single culture or even in a single social network. What is required here is thus the creation of complex integrated packages of ISTs and non-IST services that are designed from the outset to achieve immaterialisation by engendering a complete lifestyle package that will encourage lifestyle change. Such lifestyle packages will enable shift from the old failing paradigm of direct substitution to the more fruitful alternative of lifestyle change.

4. The Results of Redefinition

This redefinition and re-conceptualisation activity (which had not been anticipated or intended in the original plan for the study, but arose as a need during the first phase of the work) formed a bridge between the first and second phases of the work. The second phase (described below) had been planned to consist of in-depth analysis and explanation of the material surveyed in phase 1: the new definition particularly identified the need to investigate the three key areas of, respectively, the decision to make an immaterialising switch; the reduction in material consumption arising; and the subsequent higher rate of dematerialisation. In addition to these analysis elements, further explanation of the concepts was required in the form of instantiation.

5. Analysing Immaterialisation

Adopting a lifestyle approach deriving from the new definition,, it followed that one of the vital questions which ASSIST had to address was thus that of the factors which may be mobilised to induce people to immaterialise their consumption.

Factors (drivers) leading to lifestyle change could, as a generality, be quite diverse: within the ASSIST context of IST-led Immaterialisation the emphasis is naturally on the IST influence on lifestyle change. It is possible to create an elementary taxonomy of the factors influencing lifestyle change in this IST context, and to develop from this a table of drivers of change.

Figure 1 Classes of Factor Influencing lifestyle Change

	Individual	Societal
Endogenous	Quality of Life Enhancement e.g. IST inspired change	Altruism e.g. green-ness - inspired change
Exogenous	Commercial influences e.g. marketing and brand-led change	Societal frameworks e.g. regulatory imposed change

Each of these classes of influence will have a part to play, but clearly some will be more effective than others. Given the demand-side (i.e. personal consumption) location of Immaterialisation, the individual factors of self-interest and of commercial influences on consumption are likely to dominate. (Whereas altruism and regulation are likely to be of more consequence in the more regulatorily - determined issue of Dematerialisation of Production).

The logic of this approach is thus that the main endogenous issue to be considered is personal (including familial) self-interest, facilitated by IST attractiveness, whilst the main exogenous issue is the marketing/branding presentation of ISTs. This can be summarised rather simply: ISTs must be sufficiently attractive, and must be seen to be sufficiently attractive, to induce lifestyle change in the direction of Immaterialisation. (Of course, the development of lifestyle change will influence ISTs, in a two-way interchange: it will thus be necessary also to implement lifestyle issues in RTD and in design).

For ISTs to contribute to the maximum to sustainable development, it is clearly necessary that there should be ubiquitous take-up of ISTs. This self-evident truth invites the question - how will this be achieved? It is rather implausible that people as a whole, across the globe, should be somehow forced or regulated into IST use: clearly the take-up must be voluntary - IST pull rather than regulatory push. Regulation may well be needed to enable access, but it cannot force individuals to use that access. Similarly commercial influence seems likely to prove a more substantial influence than individual altruism. Both regulation

and the effects of altruism (a genuinely strong potential effect) apply more readily to the narrower focus of Dematerialisation of production (recycling would be a typical example of this). On a wider scale, significant changes in lifestyle generally seem to be beyond the scope of altruism to achieve (for most, but not all, people) and also of regulation (for most, but not all, governments), but in general they do not seem to be beyond the scope of marketing.

IST pull must therefore rely on the perception of the consumer that the new, more mature, ISTs advance their perceived self-interest personally or within their immediate surroundings - family, workgroups etc. In addition to the intrinsic merits demanded of ISTs, the making visible/explicit of these perceived benefits is likely to be crucially dependant on marketing and probably (given the high immaterial content of brands) on brand-marketing. The second major factor identified as central to lifestyle change in the ASSIST context is thus IST-attractiveness, mediated by marketing. This may be encouraged by governments through the medium of funded RTD, and facilitated by discriminatory taxation or by regulation (e.g. universal service provision), but ultimately IST-pull and marketing will be the dominant issues.

Consumption patterns arise from the values and preferences of individuals. IST-pull addresses the issue of preferences. There is a well-evidenced case that 'long-term value change results from generational replacement'.ⁱⁱⁱ It seems reasonable to deduce, therefore, that long-term lifestyle change will exhibit the same characteristic dependence on generational succession.

This goes beyond the commonplace anecdotal perception that the young take more readily to ISTs: there has not previously been the situation that a generation has grown up with ISTs surrounding them, but that situation is now arising. In the case of value change, it is understood that (e.g.) economic values are crucially influenced by economic conditions in an individuals formative years. IST values and the consequent lifestyle influences must surely be crucially influenced by the IST climate and by the consequent lifestyle influences in an individuals formative years. The third major factor identified as central to lifestyle change in the ASSIST context is thus generational succession. As a result, immaterialisation's time scales are long term and its scope global; it is, however, not revolutionary but relies only on ISTs that can already be seen in outline or in prototype form. Indeed, the concept of generational succession raises real questions about society's ability to absorb rates of change even as fast as those potentially available now, still less to consider even faster change. (This is not to say that the mature do not make changes in their lifestyles: but ubiquitous and far-reaching change is generally a longer term issue).

6. Post-Immaterialisation Effects

Immaterialisation would serve little purpose if it were subsequently to be un-wound or reversed by some inevitable mechanism. It may always be reversed by choice, of course, and that will doubtless happen sometimes. Such choice reversals have been observed (e.g. Fireman 1998)^{iv} but at too low a level to influence aggregated figures. Leaving aside 'withdrawal', therefore, the key issues arising post-immaterialisation seem to be the nature of the rebound from Immaterialisation (Rebound-I); and the effect of that dematerialisation occurring subsequently to the immaterialisation switch.

Immaterialisation challenges the neo-classical economic view of 'homo economicus', making rational consumption decisions, *ceteris paribus*, on the basis of cost and direct functional preferences alone. The choice to opt for immaterialisation is about lifestyle: such issues as upbringing of children; quality of life (as opposed to standard of living); and place in society weigh more heavily than cost issues. Immaterialisation may produce a cost

saving: or it may not. It is *the pattern* of consumption that is changed, not necessarily or systematically its *cost*, nor (except very indirectly) its *function*.

A primary effect of dematerialisation is to reduce the price of the good in question. This increases the demand for that good, thereby wiping out some or all of the eco-efficiency gains. Rebound-D is thus essentially an own-price substitution effect.

In contrast, immaterialisation represents a major discontinuity. People can meet their desires in full at a (generally but not necessarily) lower cost which in turn may leave them money to spend on other things, which may or may not be immaterial. Hence, Rebound-I can be described as a predominantly income effect.

An alternative mode of considering rebound, however, is as a productivity benefit. In this view, Rebound-D has represented a significant productivity gain continuously since the beginning of the Industrial Revolution (and continues to be a major component of 'multi-factor productivity' today - Ayres, Ayres and Warr, (2001))^v. By analogy, it might be expected that Rebound-I would also contribute similarly and may indeed thereby constitute a contribution of IST to productivity - possibly thus being a component of the solution to the 'missing IST productivity' conundrum.

7. Conclusions and recommendations

The outcome of the ASSIST study is a new and (for the first time) implementable understanding of what has the potential to become the dominant contribution of ISTs to sustainability. All of the essential understandings are now in place: some gaps in knowledge are identified as in need of attention, and the expression of the subject remains to some extent limited by lack of familiarity of the concepts and by the consequent lack of an accepted vernacular within which to discuss it, but it is now nonetheless possible to move away from theoretical development and on to pilot action on implementation.

Such an Action Plan for pilot implementation of immaterialisation should have as an objective the exploitation of alignments available between the commercial imperatives of IST development and the imperatives of sustainability. The broad context of the ASSIST study was the general societal benefit to be gained from Immaterialisation: in its manner of implementation, however, it is clear that substantial commercial benefits are likely to arise to those businesses in the IST sector who realise, and act on, the importance of lifestyle considerations in the development of products and services.

The Action Plan proposed would fill some perceived gaps in knowledge; develop the understanding of ISTs as 'Integrated Lifestyle Packages'; bring assessment tools (such as LCA-I) to a more advanced state that would allow confidence in their use and results; and extend the existing bridges between the IST community and those communities with wider interests in lifestyle issues in society as a whole. Its main features are as follows:

It is recommended that IST product and service design should take place in the form of **Integrated Lifestyle Packages** designed for specific lifestyles. Integrated Lifestyle Packages should be a thematic grouping for RTD activities in 6FP. ILPs offer a bridge between user-aware operators and technology aware developers which is best made at European level; unless good reason can be shown otherwise, ILPs (which should be based on persistent interfaces and a consistent user vernacular) should be a default context for product and service development.

Within the proposed thematic grouping of integrated Lifestyles Packages in 6FP, the development of tools for **Lifestyle Change Assessment of Impact** (e.g. LCA-I) is an early priority in order to validate the sustainability of the lifestyle approach being offered.

Concepts of **Quality of Life** Enhancement represent key drivers for the lifestyle change of immaterialisation. Some aspects of these seem to be conceptually insufficiently

developed for practical use in a Total Lifestyle Approach. Immaterialisation may be expected to operate in favour of the more equitable distribution of income; it may also impact on the use of income differentials as symbols of status, power and authority but there can be no certainty of this. Investigation of suitable statistical indicators for Quality of Life is urgently required, as is full development of the concept of welfare saturation.

Perceived Quality of Life Enhancement includes within it the possibility of reduced stress particularly at work. There are indicators of an inverse relationship between stress levels and trust levels in **peer-to-peer networks**; and of a direct relationship between trust levels and IST uptake. Within the theme of Integrated Lifestyle Packages, action research investigating the possible links between reduced stress levels in peer-to-peer networks (by comparison with broadcast or server networks), trust, (in the working environment), skills levels, and uptake of advanced IST solutions for e.g. decision support and knowledge management.

The development of **culturally specific IST products and services** (in the form of Integrated Lifestyle Packages), which are specifically culturally appropriate to the advancing economies, (which may be expected to provide the zones of expansion of the global middle class) should be at least an equal priority in intervention programmes in Europe to the development of ILPs for the internal market, and may need an even higher priority in the short term in order to kick-start activity.

ILPs developed in Europe for advancing nations (which themselves will necessitate indigenous involvement) must necessarily be accompanied by indigenous ILPs. Such developments may be impeded by the absence of **culturally appropriate protection for IPR in advancing nations**. European (or American, or Japanese) cultural notions of what constitute reasonable IPRs may not apply fully in other cultures, but there will always be a need for a common, secure, understanding of what constitutes IPR in a particular state, albeit that this may vary regionally. Although this is, *prima facie*, primarily an issue for such states to resolve themselves there appears to be some scope for European (or better still, joint EU/US/Japanese) action to encourage the development of culturally appropriate indigenous socio-legal frameworks for IPR, possibly in parallel with the inducement of encouraging industry-led initiatives to address differential pricing mechanisms for (particularly software) products in such states and issues such as regional coding for DVDs. Action should be taken to encourage industry-led agreements on different regional socio-legal frameworks for IPR to be implemented in parallel with differential pricing mechanisms. The example of IPRs and pricing mechanisms for AIDS treatments allows some hope that such an approach would be mutually beneficial to all parties.

ⁱ Some commentators (e.g. Lomberg, B; (2001), *The Skeptical Environmentalist*, Cambridge U P), dismiss the risks as smaller and more distant than the norm - but nonetheless admit that risks exist and assume that some preventative measures will be taken.

ⁱⁱ Doyal L, and Gough I, (1991) *A Theory of Human Needs*, Macmillan, London

ⁱⁱⁱ Abramson, P, and Inglehardt, R, (1995), *Value Change in Global Perspective*, Michigan U. P.

^{iv} Fireman S (1998) *Evaluation of the Telecommuting Withdrawal Model*, in Jackson and van der Wiren (eds) *Teleworking: International Perspectives 1998* Routledge N.Y.

^v Ayres, R and L and Warr B, *Exergy, Power and Work in the US Economy, 1900-1908* - in deliverable 4.1 of the IST project TERRA2000, www.terra-2000.org