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HOW CAN THE EUP DIRECTIVE FACILITATE ENVIRONMENTAL IMPROVEMENTS AMONG PRODUCERS OF MOBILE PHONES?

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Abstract: Based on the conclusions of our master thesis [1], this paper discusses how the implementing measures under the EuP Directive can be designed to facilitate the mobile phone producers to improve their environmental performance. Based on an analysis of the the mobile phone industry and the impacts of the RoHS and WEEE Directives, this paper questions the use of performance indicators in a score system as appropriate for implementing the goals of EuP. The Key Environmental Performance Indicators (KEPI), presented at the Electronic Goes Green 2004, is discussed as an example of the such indicators. It is concluded that KEPI and performance indicators in general do not facilitate environmental innovations among companies. An alternative proposal is suggested seeking to motivate both frontrunners and those lagging behind. The implications of this alternative proposal on different types of companies in the supply chain are discussed.

1. INTRODUCTION

The Globalisation of the production chains has made the traditionally facility bound environmental regulations insufficient to facilitate a transition towards environmental sound production. As a response, EU has introduced the concept of an “Integrated Product Policy” (IPP). The IPP promotes a lifecycle perspective and the principle of continuous improvement and utilise the marked forces to involve all stakeholders in the value chain of EE products and thereby reaches outside the European borders. The idea is to formulate product requirements that have an impact in the production chains; this involves a shift in the regulation from setting requirements to the facilities operating towards setting requirement to the products sold in the EU market.

Since the mid 90’s, the EU has as a response to the growing concerns of the environmental impacts of electronics, especially waste initiated initiatives to handle these problems. This has resulted in the WEEE and the RoHS Directives, respectively giving producers the responsibility of holding the expenses from the End-of-Life-Management of their products, and restricting the use of certain hazardous substances in their products. As both directives set product requirements they can be seen as early attempts of IPP.

The RoHS Directives impacts on the global production chains have shown, that IPP based regulation can be very effective globally. However, the implementation of the WEEE Directive, where no efforts are made by the industry to alter the product designs, shows that product requirements need to be precise and with a clear addressees for who is going to act and further that it is difficult to introduce requirements that actually utilize the market forces to favor environmentally sound products.

Based on an assessment of the structures and dynamics of the mobile phones industry, including how different companies have reacted on the WEEE and RoHS directives, this paper presents a proposal for implementing measures under the Directive on Energy using Products (EuP) for mobile phones.

1.1. Directive on Energy using Products (EuP)

The directive on Energy using Products is an attempt to implement the IPP in normative regulation. The basic idea is to impose a minimum environmental level for products that producers must follow in order sell their products in the EU market. The requirement can be formulated both as specific and generic.

Specific requirements are related to a single product characteristic and define a desired performance level for this characteristic. A specific requirement could e.g. be the demand of a maximum
level of power consumption or limit the use of certain materials.

Generic requirements are in contrast not related to a single product characteristic. The idea in the generic requirements is to allow a great deal of flexibility for the firms. The basic idea seems to be to demand a minimum performance level in the form of a score, added from performances scores related to several different characteristics of the product. The characteristics is chosen based on some kind of LCA screening and shall represent the most important indicators for the environmental performance of the product.

The EuP directive is a frame directive providing the general principles, whereas actual regulation (implementing measures) must be developed for selected product groups. The parameters and the requirement shall be targeted specifically for the characteristics of the single product groups, and the actual content of the implementing measures is not yet clear as no requirements have been approved.

So far the EU has chosen to focus on the products that have a high consumption of energy during their use. However the EuP is not restricted to reduce the energy use, but concerns all kinds of environmental issues.

Mobile phones are not yet included among the 1st round of product groups. In our view there is however a great potential and need for setting requirements to mobile phones. [1]

1.2. The mobile phone industry

The sales of new mobile phones are globally about to extend 1 billion handsets per year and there are about 2 billion subscribers world wide. Mobile phones are the most wide spread piece of electronics. In line with this there is around one subscription per inhabitant in the European countries. Mobile phones are often replaced because of fashion or technologically outdated, not because of worn out. This leads to short use phases of less than 2 years in average among European consumers.

The market is getting globalised as the fast technological development of the basic communication technology allows greater roaming and exchangeability across regions. This has resulted in fierce competition among some well-established brands and a few upcoming. This has resulted in a structure where six leading brand holders control 80 % of the global market whereas Nokia, Motorola and Samsung account for the 60 %point.

These brand holders are extendedly relying on large Contract Manufactures (CM) for the production of handsets. The production processes is therefore not necessarily fully controlled by the brand holders any longer as the case was in the past.

Furthermore both the brand holders own facilities, component suppliers and the contract manufacturers are basing their production in South-east Asian counties and increasingly China.

Brand holders are outsourcing more than just final assembling, including activities such as research, product development, supply chain management, after sales services and logistics, giving rise to Original Development Manufacturers (ODM) and turnkey suppliers as well as design-houses.

Among the design houses are large chipmakers such as Texas Instruments, which undertake a part of the development process in order to facilitate sales of their chips. Due to a growing modularity major chipmakers have developed technological platforms (the basic chips and basic software) that can be used together with multiple components allowing the developers of finished phones (whether these are contract manufacturers or the brand holders) to develop several phones based on the same platform. This has allowed the brands to provide a very large product portfolio without having to invest proportionally amount in R&D, and furthermore it has allowed contract manufacturers to produce and develop slightly different phones for different customers in high volumes, which are mainly based on the same core.

Furthermore, the use of Contract Manufacturers is not only restricted to producers of phones but also common among chip- and display producers as they seek to reduce capital investments and get access to state of the art production technologies.

Due to these dynamics, the production chains in the mobile phones industry are becoming highly specialized and fragmented. The actors involved in the making of mobile phones are spread around the globe and several of these actors are interconnected, where supplier relations of various and very complex forms. [1]

2. ECO-DESIGN PARAMETERS

As mentioned no specific implementing measures have been approved yet. However the present preparing work for those electronic products that already has been appointed, indicate that the concept behind the parameters, in addition to any specific requirements, will be to demand a minimum performance level defined by a specific total score added from scores depending on the performance in several parameters. These parameters will be chosen based on an LCA screening.

The present approach for the implementing measures proposed for other products such as PCs remarkably remind of the Key Environmental Performance Indicators (KEPI) for mobile phones,
which where proposed at the last Electronics goes green conference [2].

We will shortly present the concept of KEPI and argue for why the approach in our view should not be used as a base concept for the generic requirements targeted at the mobile phones industry.

KEPI is a tool for product developers who wish to improve the characteristics of their products. It simplifies the results of several LCA’s down to some simple design rules that developers might take into consideration in order to reduce the overall impacts. These are called “indicators” as they represent the most important environmental issues and thereby indicate the overall impacts from the phones lifecycle. The idea is, that improvement within the characteristics chosen as indicators will lead to a reduction of the overall impacts [2].

The selected KEPI are:

- Amount of precious metals, specifically Gold in the Phone
- Total amount of Printed Wiring Board in the Phone (multiplied with the amount of layers)
- Areas of the fabricated dies with the same number of step masks (comparable chips)
- Amount of bromine in the phone
- Area of LCD in the Phone
- Amount of solder paste in the phone
- Amount of copper used in the charger and its cables

Apparent these parameters are relevant indicators for the environmental impacts from mobile phones. Several different LCA that we also have reviewed reveal similar conclusions. That is that the chemical content as well as the use of resource, energy and chemicals during the production of especially the LCD, Semiconductors and PWB is to consider the main environmental impacts of mobile phones [among others 3].

However a deeper analysis the industry reveal that using KEPI as parameters for generic requirements or even as internal Eco-Design parameters would be an inefficient approach, as they lack any understanding of the dynamics of the mobile phones industry as well as the technical alternatives that should replace the bad performing designs. Using KEPI and the like as indicators do not impose better alternative, but only to use less of these. This is generally fine in respect to single chemicals where substitute are possible, but in respect to a special type of components we find the approach problematic.

KEPI’s parameters are often either against the dynamics in the industry, and therefore not likely to be implemented, or lie in prolongation of the dynamics and therefore will take place anyway. For instance the parameters to reduce the size of respectively the LCD and the semiconductor slice:

Large displays are a central competition parameter on the market for mobile phones. A parameter to choose smaller displays is therefore not feasible neither as an internal design parameters nor as a flexible regulative parameters. An approach to reduce the impacts from displays should in our view instead focus on improving the performance among suppliers of displays (e.g. less use of energy and chemicals during the production) as well as motivate brand holders to select technologies that perform better than the average. However most brands are using double or triple sourcing for LCD and other components, why such requirements could also have difficulties getting accepted.

The indicator “area of dies” (the manufactured semiconductor slice inside the chip) will opposite promote the use of small chips that have a large number of step masks, a trend that is already taking place as chips are constantly made smaller in order to use less power and space. This requirement lies thus in line with the development in the industry and as such do not impose environmental improvement other than what comes along the existing evolution of the industry.

If used as generic requirements the KEPI’s and the like parameters, the products performance in respect to the different indicators get added to a total score that need to be above a certain level. This is intended to cut off the worst performing products, but does not motivate frontrunners to make further improvements.

Furthermore companies might be able to fulfill the requirements by only making small adjustments to their product in many of the parameters instead of creating truly environmentally innovations within certain field such as use notably better performing displays, printed circuit boards and so on. In prolongation of this companies might try to affect the weighting of the different parameters in favor of their abilities in contrast to competitors. This can be exemplified with the already presented aspect regarding LCD and semiconductor slice. As these respectively are in contrast or in line with the trends the inclusion of these in the same scoring system will actually allowed telephones that uses the newest chips to have big displays whereas telephones that uses an older chip can’t use big displays and thus disadvantage those companies.

Furthermore the approach do not provide a clear direction for the environmental work as different companies might choose to act differently, (even the same companies might choose to fulfill their requirements differently depending on the single products characteristics). The companies’ freedom to fulfill the generic requirements in their own way offers theoretically some flexibility for the product
development processes. However it contributes to blur the communications of requirements along the production chain whereas suppliers won’t get clear signals on what they need to act in order to stay in business.

With the RoHS directive all suppliers knew before hand that they needed to act even before they where met with specific requirements from customers, as they knew that virtually all products sold on the European marked are covered by RoHS and that no customer will dear using components which are non compliant. This prospect of getting out of business has truly motivated the suppliers to proactively take action towards compliance.

In contrast lower tier suppliers for the mobile phones industry will not know if they will be met by customer requirements just by looking at the text of the EuP or even a implementing measures that adopt several parameter, since different companies will choose different ways of fulfilling the requirements if the imply changes at all.

The blurred communication in the supply chain could constitute a problem for the brand holders. The brands do not necessarily define the path for these fragmented and specialised production chains of mobile phones. It is thus not possible for the firm that designs the final telephone to set requirements to their suppliers and expect that these automatically will be followed. Many of the suppliers of key components such as plastics, chips and displays are developed and produced by very large companies that sell to large parts of the mobile phones industry and often also other electronic products and in some cases many other industries. Companies like Nokia and Motorola do therefore not necessarily have the “bargaining power” to demand certain changes among the suppliers such as e.g. BASF. The brand holders’ (or others who makes the design) opportunities to change the product characteristics might therefore beocket into cover a few elements. This is a point that the regulation needs to take into consideration in order to be efficient [1; 4].

This leads us to conclude that EuP requirements aimed at promoting radical innovations as well as motivate others than the worst performers should be based on another approach than KEPI style generic requirements, and instead create clear environmental directions that easily can be communicated along the production chain.

3. AN ALTERNATIVE APPROACH FOR EUP

During our thesis, we have developed a suggestion for a set of implementing measures as an alternative to the performance indicators referred to above. The suggestion is an input for discussion of how to implement the EuP directive within the mobile phones industry in a way that establishes an incitement for firms towards reducing their impacts throughout their products life cycle. It has been fundamental to us, to establish a system that both motivates the companies lagging behind as well as the companies that already are working seriously with their environmental performance.

As mentioned in the introduction, we have in our thesis investigated the industries response to the WEEE and RoHS Directives. On the basis of this work, we conclude, that the WEEE Directive has not had noticeable affect on the industry while the RoHS Directive in contrast actually has changed the industries behaviour, even in countries outside Europe, such as China. [1; 4]

The development of our input for a EuP system is based on the experiences with the effects of these Directives on global electronics industry.

We have found that there are two fundamental reasons that the RoHS Directive has been effective: 1) it communicates a simple message (no lead, mercury etc.) and 2) it excludes non-compliant companies in every step of the supply chain as no companies dare to [1; 4].

The WEEE directive is on the other hand much more complex and does not impose clear goals. It is not clear was it required of the different actors in the production chain (EoL-M). Furthermore the directive fails to even establish an incitement for product changes towards improved End-of-Life-Management, as the logistic cost associated with the waste handling constitute such a large part of the overall management cost, that the gains by differentiation through design changes are to low compared to the logistic needed to impose such a system. The effect of WEEE is thus limited to an increased competition in the waste-handling sector, instead of in the supply chain. [1; 5].

These different effects of RoHS and WEEE makes it clear why the use of several parameters confuses the picture more than facilitate a shift towards environmental sound production. The KEPI and the like are failing to point out the direction for the needed innovation, especially when it comes to innovations among firms in the upstream. With these considerations as inspiration and based on an the structures and dynamics of the mobile phones industry we have developed the following proposal for implementing measures, which focus on establishing a clear direction for the innovations and at the same time, gives flexibility so that proactive companies can gain competitive advantage by keeping their position up front or through means of cost reductions.
The basic idea in this model is to make the specific requirement market excluding, and used the generic requirements as extensions that motivates the companies to perform better than the minimum performance level through economic motivation. Opposed to the existing approaches for Implementing Measures under the EuP (e.g. those developed for PC’s) as well as previous papers discussing the EuP [6, 7, 8], the fundamental regulative instrument in our suggestions are the specific measures rather than the generic measures. By using the specific requirements as the basis, we can create a collective pull, regarding the environmental development of the industry, as all companies will work with the main priorities. Such an approach uses the dynamics of the industry to establish an innovation pulling in the same direction [1].

As it can be seen in the figure, both the RoHS and WEEE Directives are part of our alternative EuP system whereas there are links between the different regulations within an area and thereby create a jointly regulative pull intended to affect all stages of the lifecycle. EuP should facilitate the WEEE and RoHS Directives such that issues that WEEE and RoHS is not appropriate to take care of are handled in the EuP system. We propose however adjustment to both the WEEE and the RoHS, but these suggestions lie within the overall objectives of these.

Regarding the EuP requirements there is a close connection between the specific and generic requirements. The principle is, that the specific measures point out the direction, and establish a minimum standard for what will be accepted on the common market, while the generic measures constitute an opportunity for the proactive companies to differentiate their products on the market.

The generic requirements have a rather different character than in other proposals. Instead of being connected to a score system where a minimum performance level is needed to reach compliance, the compliance, and thereby market access, is a matter of fulfilling the specific requirements. The generic are instead connected to a progressive fee system, according to the products performance within the generic requirements. This creates an incitement for companies to do more in order to improve their environmental performance as an extension of the specific requirement. The idea is that these generic requirements foster the possibility for tightening the specific requirements over time and thereby facilitate continually improvement within the industry.

The fees collected by the system of the generic requirements are placed in a fund that finances R&D in new components, materials, technologies etc. as well as finances knowledge gathering within these areas. The funds activities shall facilitate the industry towards producing more environmentally friendly products. It should be a goal to create innovations within areas where the pull mechanisms have difficulties creating motivations along the supply chain. At the same time companies shall be able to search funding. This way the fees are going back to the industry as subsidies that further facilitate the adoptions of environmental superior technologies. In addition to impose the adoption of better technologies the fund could also provide valuable information for reviewing the requirement of the implementing measures.

3.1. The excluding requirements

In the following we will present our proposal for concrete requirements that we based on our assessment of the industry as well as the available knowledge concerning the technical aspects.

As specific measures we suggest: **Standardised disassembly (e.g. ISO)** as such is needed before it can be profitably for the waste handler to dismantle the telephones fast into part that are possible to regain...
other than the precious metal; *Amount of reused materials* as an effort to increase the demand for reprocessed materials and thereby the profitability of recycling materials; *Eco-Design management system* as there is a great need for management system that in similar way as the special certifications that are needed in the car industry can guar; *Marking of plastic parts* as this can ease the sorting of different plastic parts; *Chargers standby energy use* has no functional use why the power just should be switched off when not loading; *Standard interface* as chargers, headset and other accessories often use customised interfaces why these need to be changed together with the phone after less than two years contributing further to the resource consumption; and finally *Future requirements*, as the requirements mentioned above only are what we find appropriate and possible according to the challenges the industry is facing today. In order to be progressive and support continual improvements, it is necessary to update the requirements according to new technology and innovation. The above-mentioned fund shall provide input to how such requirement could be.

In our thesis we have used a lot of affords to discuss how to establish requirement that enables innovations towards cleaner LCD, Printed Wiring Boards and Chips – addressing the same issues as KEPI, but in a way that facilitates innovations rather than just regulate the size and weight of the components and materials used. However it has proven difficult as there both is a lack of knowledge due to business secrets among the companies (e.g. regarding the content of displays) as well as a trend in the industry to use several different supplies of the same component in order to secure supply stability. The idea with the fund is thus to provide knowledge that enables the adoption of appropriate requirements.

In addition to these specific requirements the RoHS and WEEE is proposed altered a little bit:

In WEEE is proposed a *Refund system* as mobile phones in contrast to waste from bigger electronic products (e.g. TV’s) easily end up the household waste stream. Therefore it is of great importance to impose a refund to secure that the phones are return and treated in the right waste handling system. In addition to the existing *Waste treatment requirements* is added a requirement for waste handle to apply the treatment according to the standard required as specific measures.

In the same way is the restricted substances in RoHS proposed banned (with a tolerance level) as we believe is creates a more clear picture. Furthermore is new substances added to the now after 1\textsuperscript{st} of July empty list of coming regulated substances. This is to facilitate companies by giving them sufficient time to know before hand which substances will be banded in the future, and the industry has good time to implement the transition.

3.4. The facilitating elements

The facilitating measures are indented to be supporting for the specific and market excluding measures. This is why the measures are very similar to the previous measures; however these facilitating measures are stricter than the specific requirements.

First of all shall the fees depend on the performance in relation to the: *Amount of reused materials*, as a mean to further increase the demand on reused materials; the present of substances on an *Observations list (substances of concern)* which at the same time functioning as a *recruiting list* to the list of future band substances and thereby indication to the industry which substances the regulation considers unwanted and thus substances that in time likely will be band; and finally get rewarded for having *no use of coming band substances* and thereby securing that companies having advantages not having substances of concern keeps those after a date for bands has been provided, but further also motivate for faster adoption than the timeframe provided.

Also in the generic measures we have a *future requirements* for the same reasons illustrating that also some more experimental requirement could be tried out before deciding how to precise formulate a specific requirement

In addition to the bonus of getting lower fees, we suggest to connect this evaluation of al products to the flower such that the best performing receives the flower.

4. CONCLUSIONS - HOW ARE COMPANIES AFFECTED BY THE PROPOSED SYSTEM?

Learning from RoHS, our system establishes a uniform pull by setting specific requirement as baseline rather than a generic score system of different performance indicators. This means that it is clear for the companies if they need to take actions in order to be in compliance, and furthermore it is pointed out which way the regulation intends to develop. The companies in the supply chain cannot assume that someone else is responsible to secure the necessary changes for the product to be in compliance with the regulation. This means that the brand holding companies do not need the same effort to coordinate how to comply and they don’t have to argue why it is the chosen strategy and why it is the specific actors that need to act and not some one else in the supply chain. Everybody should know how to act. By setting market excluding minimum standards, the brands can use the regulation to show the need for changes. Opposite if the regulation does not set the
direction, the requirements will not be communicated down the supply chain the same way, as the responsible for acting depends on the brand holders’ choices. The changes are thereby subject for negotiations. In addition, the suppliers of several brand holders might need to handle different strategies for gaining compliance, as their customer might chose different ways of fulfilling the regulations. Even the same customer might choose different strategies depending on the type of product (e.g. for high-end and low-end telephones). A regulation that gives various directions will furthermore properly have the consequence that companies will try to favour the direction that is compatible with there present strategy and disadvantage their competitors rather than actually make an effort to alter their performance. It will therefore become a question of negotiating in order to lower the performance, rather than creating actual environmental improvements.

We therefore argue that a system that points out one direction, rather than several will be an advantages for the industry – both for brand holders that more easily can implement the requirements in their supply chain, but also for suppliers that will get similar requirements from many customers.

In order to secure the dynamics of the system and foster continual improvements among the industry, our system apply an opportunity for the companies to differentiate themselves from their competitors economically and receive the flower-label if they are among the best performers. The generic requirements are used quite differently than what seems to be the generally trend. However, we believe that a system with to much flexibility in relation to choosing the improvement areas is inefficient. A system as ours, will establish “connected” regulation and regulative pull towards more sound environmental solutions in connection with the RoHS and WEEE directives. This allows the companies that are able to control their supply chain to obtain better performance than the minimum requirements and gain competitive advantages by going further.

However companies might oppose to the fee system and argue that it is just a new way to put extra fees upon them. In this respect it is important to keep in mind that what is important for companies possibilities for doing business is there possibilities for differentiate them selves (either economically or in other ways) from their competitors. The system is equal for all who sell products in the common market within their sector. The fee system therefore just adds a new area for competition. The system can be seen as imposing extra fees on mobile phones compared to other products, making the mobile phone relative more expensive. The concept in our system is however, that the fees collected are canalised back to the industry through a fund aimed at facilitating green innovations. Hence the system does not impose extra fees on the sector as the fees are paid back to the companies. However the funds are redistributed in favour of those companies that have a better environmental performance or who actively are trying to find new and cleaner technologies.

An further initiative, in line with this approach could be to consider altering the general EU fees and tax approach concerning import taxes and other product related taxes and fees, so that these favour political preferable products e.g. environmental superior products, rather than using the taxes as an import barrier. This would also be more in line with the philosophy of the WTO providing the same conditions in respectably the origin of the product.

5. REFERENCES


