Innovation and International Competitiveness in the Context of Open Innovation and User Integration: A Qualitative and Quantitative Analysis

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Introduction, Literature Review and Hypotheses

This paper analyses empirically based on qualitative in-depth case studies as well as a quantitative survey the role of integrating users and other external parties with different corporate functions and management processes for innovatory activities and firm competitiveness, especially as concerns environmental and social aspects. Since the novel paradigm of open innovation is increasingly becoming relevant for innovation processes in general, the paper also analyses environmentally-related R&D cooperation of companies and the determinants and effects of such cooperation. This theme is particular relevant from a European point of view given the recent communications and initiatives by the European Commission on CSR and sustainability as well as the prominent role of the latter in the new 7th Framework Programme of the EU. Also the Lisbon agenda with its focus on the quality of life of European citizens requires that firms reconcile sustainability aspects with competitiveness and innovation has been identified as key to defuse sustainability demands, which immediately leads on to the question how innovation can be directed to specific forms of technological progress and when it actually should be (beyond policy makers attempting to merely influence the rate of innovation).

Open innovation and user innovation are (partly related) phenomena that have been much debated recently in academic communities and by business practitioners recently. They are, as is explained in the paper, particularly relevant in the context of sustainability-related innovation (Fichter 2005). This is because cooperation (e.g. in terms of innovation networks, acquisition of innovation, or other forms of open innovation) seems to be relevant for sustainability-related innovation to the degree that such innovation is technologically radical and complex i.e. requiring the involvement of a large number of actors or capabilities and having significant technological, economical and company-specific uncertainties which require the bundling of different resources and competencies (Konrad & Nill 2001; Hart & Sharma 2004). In addition to this, sustainability-related innovation is, as we argue, by definition characterised by proportionally higher social benefits for users relative to private benefits that accrue to manufacturers. Also sustainability-related innovation, at least for some user groups implies considerable immaterial benefits and this should lead to higher incentives to innovate for those users than for manufacturers and should result in increased user innovation activity. Our research hypothesis is thus an association of user integration and openness and cooperation in innovation with competitiveness and innovation activities.

Data, Methodology and Results

Based on exploratory data collected during thirteen in-depth case studies in American, French, German and Swiss firms matched for size and industry sector, we identify critical elements in corporate structures and processes that lead to integration of sustainability aspects into innovation processes through cooperation, user innovation and openness in innovation. We also explore how such activities affect firm competitiveness. The case studies are focussing on renewable resources for mobility and communication applications as well as industrial products draw on interviews with several members in each organisation responsible at senior management level for sustainability, strategy and innovation aspects which were

carried out based on qualitative interview guidelines. To triangulate and supplement the findings from these interviews corporate reports and press releases, archival data and publicly available third-party information were additionally used.
Our paper discusses results from analysing qualitatively and quantitatively the case studies. Our analysis shows that market demand is a pivotal factor that limits or pushes suppliers particularly in business-to-business contexts towards leadership for sustainability and that user integration may be an important aspect of this. We also find that in an increasingly globalized business world the open innovation paradigm has increasing relevance for sustainability-related or environmental innovation (Rennings 2000). More specifically, the case studies reveal, that specific corporate functions can support user integration, that next to size also the corporate culture of a firm influences whether or not a firm is integrating users (i.e. also small firms can cooperate extensively with users, end consumers or retail consumers) and that for small firms also resource constraints make it more likely that products are developed together with a cooperation partner.
To test the robustness of the findings from the qualitative case studies in a more representative manner, we carried out a survey amongst German manufacturing firms. In this survey, through a number of questions we solicited responses from firms on the relevance of user intgration in their product and processes innovation activities as well as on the role of openness in their sustainability-related innovation processes and firm competitiveness in a more formal and structured manner. Mailings to approx. 2000 firms in the German manufacturing sector yielded 169 responses. Based on the survey, we constructed two different variables to measure user integration and openness with good Cronbach Alphas. We test whether these are predictors for product/process innovation as well as for competitiveness measured in four dimensions based on extant research (Wagner 2003). In our model, we also include dummy variables for industry membership as well as for the existence of quality management and other relevant factors influencing innovation activities and firm competitiveness in this context. Based on these variables derived from extant work, we apply logistic regression, using user integration index as well as an index measuring the degree of a firms' attitudes towards free revealing and a percentage figure of the share of innovations revealed freely. Given that product and process innovation are determined jointly we assure that using separate regressions does not lead to biased estimates compared to multivariate ones by also estimating a multivariate probit model and rejecting significant correlation.
The association of openness and user integration with competitiveness is analysed via OLS regression. For the innovation regressions, both models are overall significant and have very good model fit and classification power. In both models, neither openness nor user integration associate with innovation. Compared to this, as concerns competitiveness, user integration is generally significantly and positively associated, whereas openness is negatively associated (yet not always significantly). Jointly, our qualitative and quantitative analyses confirm therefore the important role of cooperation and user innovation for sustaina-bility-related innovation and competitiveness, but they also point to a possible challenge for firms to reconcile innovation and market performance which should be explored further.

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