Inter-firm coordination as an Information problem.
The case of a divisionalized company

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5. The case of outsourcing relations of a divisionalized company

5.1 Methodological issues and research site

All observations will be reported from the point of view of the customer, which is the business unit of an Italian division of a multinational company, here called Electronic Company (EC), operating in the semiconductor industry. This case was chosen for three main reasons: 1) the complex nature of the production technology, typical of this industry; 2) the divisionalized structure of the firm; 3) the outsourcing strategy followed by the company. These points underline the needs for coordination between the activities accomplished by the business unit, here referred with the pseudonym of Electronic Business Unit (EBU), and the activities assigned to external subcontractors, taking into consideration that EBU’s subcontractors engage in relation with other different business units of the same company. Furthermore, these points justify the use of a single-case design, as the case we have selected represents the typical case (Yin, 2003 b.).

In order to develop an understanding from the point of view of a coordinating entity, the research site was established at EBU, which was preferred for the personal relations between the researcher and EBU’s managers, facilitating data gathering and direct observations; but, more importantly, EBU was selected for its thick outsourcing network. The period of observation was defined so as to include the main changes in the coordination practices we were interested to describe and explain. This entails to choose the period from 2005 up to 2009.

5.2 Data sources

While our observations were focused on a five year period (2005-2009), we conducted three annual visits over a three year period (2007-2009). The choice of a longitudinal study allows us to observe how coordination
mechanisms have developed within the five year period emerging from different conflicts. Data were gathered through interviews, direct observations and documentary analyses. A list of subjects and data sources can be provided by the author upon request.

We interviewed managers working at three business units, whose pseudonyms are: Electronic Business Unit (EBU), which represents the focal research site; Analogical Business Unit (ABU), which operates within the same division as EBU, and Global Outsourcing Business Unit (GOBU), which is a business unit made responsible for the supply management of all EC’s divisions. Particularly, as we needed to understand coordination practices adopted in the interaction between EBU and its sub-contractors, besides EBU, we acknowledged relevance to GOBU, for its coordinating role in all EC’s outsourcing relations, and to ABU, for it has often competed with EBU in the planning of outsourcing capacity. We saw this point very important for understanding coordination practices in a multi-division context. More specifically, the data provided by ABU are directed to improve our understandings of how coordination problems were perceived by managers from each business unit, and of the coordination practices adopted by EBU in its outsourcing relations. Therefore, we do not report any description of ABU’s competitive strategy and production process, which is not relevant for the aim of the present study, but we observe that both are quite similar as the EBU’s ones.

The managers interviewed are: among EBU’s managers, the Financial Control, Business Planning Manager and the Planning Manager; among ABU’s executives, the Process Quality Control Engineer; among GOBU’s engineers, the Short-term Production, Planning Engineer, as listed in the table enclosed in appendix B. Furthermore, direct observations were made by researchers at EBU site, during which we were allowed to attend some meeting at EBU site and assist to call conferences between EBU and its subcontractors. This gave us the opportunity to share managers’ perceptions of some concept, such as information complexity, that cannot be completely captured through interviews, to live the real-life problems, and to observe the way in which specific practices are directed to find solutions. Throughout the three year period of our visits seventy-six interviews were conducted; both interviews and direct observations required three annual visits at EBU and ABU sites (GOBU engineer was interviewed at EBU and ABU sites), while two initial meetings and four interviews took place at the University Department office; direct observations were carried out with interviews during the same meeting. A detailed report of the interviews is given in appendix B. The number of interviews was not programmed, but
based on theoretical insights: we concluded the interviews when we perceived to have data for a complete story.

The interviews were conducted in different ways, according to the stage of the data collection process. At the beginning, we conducted semi-structured interviews, intended to gather data for EC and EBU description and to map EC and EBU’s sub-contractors network. To this aim, we administered a questionnaire. It required to specify in a first part the competitive strategy followed by the company and by EBU, which was relevant for understanding the critical issues of coordination process; the role assigned to the management control system; the role and the structure of the information system in use. A second part of the questionnaire was devoted to identifying the stages of EBU’s production process that involve outsourcing relations. Further, in the second part of the questionnaire it was asked to assess the degree of task programmability, as was perceived by EBU’s managers, with respect to the different stages of EBU’s production process. This part ends asking the parameters by which EBU assesses the performance of each sub-contractor. A final part of the questionnaire was devoted to describing the outsourcing relations that can be considered as partnerships. With regard to an average partner, it was required: the reasons why the relationship was created; the length of the relationship; the presence and the relevance of relation-specific assets; the content of the contract regulating the relationship; the performance measures adopted by EBU; the main information needs perceived with respect to the relationship; the type of information sources and information flows referring to the relationship; the value perceived from the use of the described pieces of information. Finally, it was required to describe the pieces of information that are exchanged with sub-contractors, specifying the nature (formal versus informal) of the information exchanged, and whether the information exchange is two-way or one-way only. The interviewed managers mentioned above and the researcher filled in this questionnaire during informal conversations, which lasted around three hours, on average. This allowed us to gather additional data, not predicted in advance.

In more mature stages of the data collection process, interviews were intended to describe the various episodes around EBU-subcontractors interaction in order to highlight the main coordination problems, understand why and how they originate, and identify the principal practices directed to solve them. Consistent with this purpose, the interviews were conducted in the form of narrative discussion and lasted two to three hours approximately (see table in appendix).
Documentary analyses are further data sources. We had access to several internal documents, referring to outsourcing relations, such as: supply agreements; production plans; reports and documents containing technical instructions and cost data. Further documents were accessed on newspaper articles and on the company’s website, and provided data on the description of the company’s strategy and of its production processes and supply network. These multiple data sources allowed triangulation during the subsequent data analyses.

5.3 Data analyses

Because of the confidential nature of the issues discussed, only few interviews were type-recorded (Kaju´ter and Kulmala, 2005), while most of them were conducted in an informal style; all were written down in a draft-report and sent to the interviewees. The reports were discussed with interviewees in the following meetings and written down to form a case-history. Afterwards, we selected from the case-history those episodes relevant for the aim of the present study. The description of the EC and EBU’s supply network, and of EBU’s production process was drawn from both interviews and company’s documents. This allows data triangulation in assessing the degree of information complexity and goal conflict. To observe both the factors we decomposed them into relevant variables referring to the coordination studies mentioned earlier. Thus, information complexity was analyzed in terms of computational complexity, mainly referring to task programmability or predictability (Galbraith, 1977, Grandori, 1997 b.), and cognitional complexity, as lack of knowledge of the task or process to be handled (Grandori, 1997 b.). Task programmability was measured as the number of operations (high versus low) that can be predicted in advance with respect to task execution. We gather data on this variable first from company’s documents, second from the questionnaire, third from discussing the questionnaire during further meetings. Lack of knowledge of a task or a process was mainly assessed by means of managers’ arguments. We gather data on this variable from narrative conversations and direct observations. Goal conflict was assessed on the basis of how compatible managers perceived the individual goals of the different actors. In doing so, we took into account the organizational role played by each actor within the company’s supply network. Hence we assessed a higher (lower) goal conflict between actors operating at a different (the same) division, at a different (the same) hierarchical level (Simon, 1964), at a different (the same)
company. Moreover, goal conflict was positively associated with the degree of competitiveness between the actors due to the dependence on common resources (March and Simon, 1958). The degree of competitiveness was assessed on the basis of both interviewee’s perception and of the company’s supply network mapped through the questionnaire and company’s documents.

Since some of the reported episodes occurred before the three year period of our visits (2005-2006), we distinguished episodes prior from episodes during our visits. The former were described by relying on retrospective approach: we asked managers to describe, explain and reflect on events they had experienced in the past (Scapens et al, 2007). The multiple data sources and the subsequent data triangulation attempt to overcome the limits stemming from relying on interviewees’ memories.

5.4. Production process and the management of the outsourcing relations

5.4.1. Production process

Semiconductor technology is adopted by EBU for manufacturing integrated circuits, which constitute the general output of their processes. Such a circuit is a small but very sophisticated device implementing several electronic functions. Its major parts are a tiny and fragile silicon chip (die) and a package, protecting it. The manufacturing process of an integrated circuit can be divided into two macro-steps, commonly known as “Front-end” and “Back-end”. In the Front-end step, the integrated circuits are fabricated through different operations accompanied by electronic treatment and doping gazes. The Back-end step requires a less sophisticated technology separating the silicon chips, assembling the dice and packaging them. The devices are then marked with a “traceability code” which is used by the manufacturer and the user to identify the function of the device (and its date of fabrication).

At the end of the assembly process, the integrated circuit is tested by automated test equipment. The bad dice are automatically marked with a black dot so they can be separated from the good dice after the wafer is cut. A record of what went wrong with the non-working die is closely examined by failure analysis to identify any problem. The percentage of good dice on an individual wafer is called its yield. Only the integrated circuits that passed the tests will be packed and shipped to their final destination.
5.4.2. The management of the outsourcing relations

From the description of the manufacturing process we can notice that the Front-end requires a capital intensive technology while the Back-end a labour intensive one. The difficulties to accommodate two very different production systems, coupled with the cost pressure from the competitive environment suggested the outsourcing of most of the Back-end operations, which are now accomplished by several sub-contractors located in different countries. All the assembly and testing operations are outsourced. The components that pass the test are delivered by the sub-contractors to EBU. Thus, it is EBU that packages products with its brand name and ships them to the final users.

The sub-contractors are selected according to specific criteria, such as quality, service, commercial behaviour, technical, and development skills and capabilities. Based on these parameters, the sub-contractors’ evaluation process is periodical and performed at the company level by a specific business unit made responsible for the outsourcing management of all the divisions. Hereafter, we will call this unit GOBU. To perform its role in an efficient and effective manner, GOBU is delocalized close to sub-contractors’ plants. Focusing on the planning process, GOBU is intended: a) to provide the divisions with an efficient logistic service; b) to lead sub-contractors towards the excellence of their operations; c) to assure supply chain visibility; d) to allow a rapid solutions of sub-contractors’ production problems.

GOBU fulfils all these functions by managing outsourcing relations with fifty-two sub-contractors at the corporate level, which entails the coordination of eighty-one sub-contractors’ plants. The centralized management of the outsourcing relations is intended to gain more efficiency both by means of economies of scale during the negotiations, and concentrating the exchange of information flows with sub-contractors. More specifically, to reduce redundancy in the amount of information the different divisions transmit to their sub-contractors, GOBU intermediates in these information flows.

Another reason for this centralization is the need to prevent opportunistic behaviour on the part of the sub-contractors, who may consider the sale of the components they have manufactured for EC’s business units. Since many sub-contractors are EC’s competitors, such a behaviour is not unlikely. Moreover, as this kind of behaviour has been observed in the past, a set of parameters is regularly used to monitor sub-contractor activities. We will discuss these parameters in the sub-section 5.5.1.
In what follows we will study more in depth the dynamics of how GOBU and EC’s divisions or specific business units, particularly EBU, have managed the information flows to coordinate within outsourcing relations. More particularly, we will focus on EBU, which is the focal unit of the present research. It operates within a division comprising four business units, including EBU and ABU, another business unit competing with the former in several outsourcing relations. Being EC’s divisions mainly defined according to technological homogeneities, most of the EC’s sub-contractors are common to EC’s business units operating at the same division. Specifically, twelve of the fifty-two EC’s sub-contractors are EBU’s sub-contractors and eight of them are shared with ABU. On average, the time-length of EBU’s outsourcing relations is around three years, which is approximately the same at EC level, being it defined by sub-contracting agreements, and is considered a high rotation rate by EC’s managers. The autonomy of each business unit in managing outsourcing relations was subject to changes within the period of our observation, as discussed in what follows.

5.5. The information flow for coordination within the outsourcing relations

The management of information flow between EC’s divisions and sub-contractors has changed over time. The most important changes were due to the development and implantation of a project that modified the way in which information flows are exchanged among EC’s business units, comprising GOBU, and sub-contractors, which was proposed by the management working at EBU. We considered this project relevant for the present study for it impacted on the coordination process and mechanisms adopted in EBU’s outsourcing relationships. Hence, we organize the following discussion distinguishing two periods: 1) the period prior to the introduction of the project, from 2005 up to 2006, preceding our visits; 2) the period during the development and implementation of the project, whose launch coincided with the beginning of our visits and data gathering.

5.5.1. The information flow within the outsourcing relations prior to the introduction of the new information system project

When the different divisions of EC directly interact with a certain sub-contractor, inefficiencies may arise for different reasons. The Short-term
Production, Planning Engineer of GOBU reported as examples the situations in which:
“a generalized delay in the work in progress can induce the managers of different divisions to put pressure on the same sub-contractor, competing with each other, and so confusing the situation. Other kinds of problems may arise during the communication between persons from distant countries, such as misunderstandings and delays due to the different time-zones. Think about a Chinese sub-contractor whose production problems may need technical support from some Italian EC divisions; given the time-zone, he has to wait at least seven hours for a response, generating high costs for the loss of productivity”.

The centralization of the information flow exchanged between the different divisions of EC and its sub-contractors avoids such inconveniences. All information flows are mediated by GOBU whose location, close to the main sub-contractors’ sites, overcomes the kind of problems described above.

The flow of information mediated by GOBU regards: a) the production plan defined on a monthly basis, containing the schedules for the production to be launched and the management of the productive capacity; b) the weekly production plan, which is transmitted each Monday; c) the documentation containing productive instructions, technical and cost data, used in the monitoring of sub-contractors’ activities and in corrective actions.

The mediation of GOBU in all the above information flows exchanged between EC’s divisions and sub-contractors can be represented as in fig. 2.

The pieces of information mentioned above are exchanged by means of coordination practices such as: production plan, monitoring of sub-contractors’ activities, corrective actions. Each coordination practice is described in table 2, which reports the coordination practices adopted prior and after the introduction of the new information system project.

This complexity can negatively affect the quality of the information flows conveyed by means of the coordination practices described above. Regarding the importance of the quality of the information exchanged, the Process Quality Control Engineer of ABU explained:
“Wrong or non-updated information may imply relevant inefficiencies. For example, an under-estimation of work in progress volume may lead to the date of delivery being delayed. Thus the updating and the synchronization of information flows are the most critical points in the supply chain management”.

With regard to this, the manager mentioned as one of the main obstacles “the structural differences between the information systems of the partner firms”. Further problems stem from delay in information sharing. Even if
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an Electronic Data Interchange (EDI) system is adopted to enable the transfer of large amounts of data, the system is only uploaded weekly. This reduces the flexibility in the interactions between EC’s divisions and subcontractors, making mutual adjustments difficult to manage. The EBU’s Planning Manager reported some examples of these adjustments:

“Simultaneous interactions between each single business unit and its sub-contractor are required in case of rapid changes in the sales order mix, or in case of technical problems due to the management systems used by the sub-contractor. Once, visiting the plant of a sub-contractor, I noticed that process inefficiencies were caused by the lack of a standard batch in the production process”.

The quoted managers’ remarks were made more relevant by the complex interaction between each business unit and its outsourcing network, given the high variety of the product components, as discussed above.

Hence, the period preceding the introduction of the new information system project was characterized by a centralization of the information flow between EC’s divisions and subcontractors, orchestrated by GOBU. Although this solution avoids some inefficiencies, it shows a high degree of rigidity in managing the outsourcing interactions. The Process Quality Control Engineer of ABU identified the main problems in the management of information in the difference between the information systems of the partner firms, while the Planning Manager of EBU identified problems in the low frequency of information updating, which made mutual adjustments difficult.

5.5.2. The information flow within the outsourcing relations during the introduction and implementation of the new information system project

Differences between the information systems of the partner firms are a structural problem, difficult to solve in the short term. The need to update the information flow more frequently could be dealt with by leaving each division and business unit with more room for autonomous manoeuvre, in order to allow an incremental approach directed to ex-post modification of relevant parameters. During our visits, we noticed tension between GOBU and the individual business units: the former wished to maintain its central role in managing the information shared with sub-contractors, while the latter tried to bypass GOBU and directly share the information needed for mutual adjustments.
EBU’s managers as well in the continuous adjustments with subcontractors perceived such problems. On several occasions, the central role of GOBU was viewed as a paralyzing mechanism. As the Financial Control, Business Planning Manager of EBU noted, “Each time EBU needs fresh information on production and work in progress volumes, stock levels, and delivery times, on technical problems and required adjustment... EBU has to ask GOBU for the information required or transmitted to the sub-contractor. Such a mechanism is paralyzing and time wasting and makes adjustments useless”.

During our visits we were allowed to attend various call conferences between EBU’s and an Indian sub-contractor’s managers, and internal meeting at EBU site related to specific problems with that sub-contractor which had been discovered with a relevant delay. The Planning Manager of EBU described these problems as follows: “Because the sub-con reports on wip (work in progress) volumes for each product component only weekly, that is on Friday, it could hide relevant problems related to its production process. Specifically, once, a bottleneck occurred in the sub-con’s production lines interrupting the production flow, thus entailing a rise in the wip volume at the point where bottleneck occurred and a drop in the production volume. But our problem is that we knew of that five days later, when we received the production report on Friday, showing a high wip length and delinquency. In the call-conference directed to understand what had happened they could not avoid to explain what I told you, but it was too late! And also we could not verify whether they were telling the truth”.

The reported episode induced EBU’s managers to express, during a meeting at EBU site, their intention to require the approval to bypass GOBU when the communication with sub-contractors was directed to support ongoing adjustments. The idea was to be allowed to directly interact with sub-contractors without involving GOBU in all the information flows supporting ongoing adjustments. This proposal was examined during a corporate meeting and was considered not in line with the central role of GOBU in the management of all EC’s outsourcing relations. Particularly, GOBU’s managers, who were attending that meeting, defended the role of GOBU as an important corporate innovation: this was intended to lower transaction costs centralizing information flows with sub-contractors, for it avoids competition among EC’s business units and redundancy of information exchanges.

However, the aforementioned episode reported by the Planning Manager was not the only one. A similar problem arose when a customer required changing some product components. As the Planning Manager told us:
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“The required change in the customer’s order was not avoidable, given the relevance of that customer. Thus, we needed to modify our production mix in order to reduce the production volume of the component to be changed and to increase the volume of other components. But, as we couldn’t quickly modify the production plan communicated to the sub-con, the increase in the production volume of one component was the only effect, with a growth in the stock level”.

This problem affected different parameters of EBU’s performance, especially in an increase in stock levels and induced EBU’s managers to negotiate with GOBU managers to find reasonable solutions. The basic idea was to be allowed to directly interact with sub-contractors for ongoing coordination purposes without sacrificing the central role of GOBU.

A project was launched, concerning the development and implementation of an information system parallel to, but less sophisticated than, the GOBU one, which was directly managed by the Planning Manager of EBU. To respect transparency within EC, all the information shared between EBU and its sub-contractors had to be communicated to GOBU as well. The structure of the interaction between EBU and sub-contractors, mediated by GOBU, can be depicted as in figure 4.

(see figure 4 in appendix)

Under these rules, the new system, even if very rudimental, conveys daily information that allows the monitoring of work in progress and production volumes, stock levels and deliveries. Moreover, to deal with rapid changes regarding the production plan, a procedure of manual work orders and manual call offs was created, which updates the weekly production plan according to the contingencies that emerge during its implementation.

An in-depth description of the interaction between EBU, GOBU and sub-contractors, considering: the weekly production plan, the monitoring of sub-contractors’ activities, the corrective actions, is offered in table 2.

Specifically, during corrective actions, technical knowledge is transferred to sub-contractors through the training of their managers and engineers. In this regard, the Planning Manager of EBU told us about one of his own personal experiences with an Indian sub-contractor:

“I visited the sub-contractor plant to investigate the causes of the very low performance level which involved delays in deliveries, a systematic de-commitment to the productive capacity to be assigned to EBU, and a high variance of cycle time. My visit was helpful for the diagnosis of the problems. The delays in deliveries were caused by an incorrect scheduling process; the cycle time was calculated on varied, instead of standard, batch sizes. Finally, the lack of commitment arose from faulty commercial behaviour of the sub-contractor: his concern to preserve the relationship with important customers, such as EC, induced the sub-contractor to accept all orders, thus overloading its productive capacity”.
Table 2 reports the coordination practices adopted prior to and after the introduction of the new information system project. It is opportune to specify that all the above practices, and their dynamics, do not differ from a subcontractor to another, being they subject to the corporate approval.
(See table 2 in appendix)

The project under discussion was firstly developed and introduced by the Planning Manager at EBU, to manage EBU’s outsourcing relationships. Since information flows exchanged between EBU and its subcontractors were transparent to GOBU, the project was not perceived by GOBU managers as violating GOBU role and functions. After three quarters the growth in the performance parameters shown by EBU’s subcontractors, and its impact on the performance level of EBU, was used by the Planning Manager at EBU as an argument to defend the effectiveness of the project, which was extended to all business units working at the division where EBU works, upon request of the division executive, and later on to all EC’s divisions.

5.6. Case discussion

The case described above is here interpreted through the lenses of the theoretical framework proposed in section 4. After defining the system under observation (section 5.6.1), we recognize: a) the main arguments underlying the opposing thesis and antithesis, i.e.: from the perspective of each entity, information complexity as an individual coordination problem (section 5.6.2) and individual goals (section 5.6.3); b) the goal conflicts between the entities as a dialectical coordination problem, from an interactive perspective (section 5.6.4); c) the emerging synthesis in terms of combination among the coordination mechanisms put into practice (section 5.6.5).

5.6.1. The system under observation

The outsourcing relations observed in the case refer to EBU and its subcontractors. However, they involve systematic interactions within a set of entities, which can be considered as units of the broader EC outsourcing system. These entities are EC’s business units, observed through EBU, which is the focal unit of the research, ABU, which is relevant as an EBU’s competitor in several outsourcing relations, GOBU, the unit at the corporate level regulating outsourcing relations at the whole EC’s system, and EBU’s subcontractors. Their interaction enacts operation processes and
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Information flows. The operation processes can be specified from the description of the production process. The Back-end is the phase which is mostly outsourced with mainly manual operations. These processes are regulated by information flows transmitted in advance, for example, by means of the production plan, and simultaneously, namely by means of manual work orders, call offs, and informal communications. Within such a system, coordination problems can be described analyzing the appropriateness, perceived by different managers, of the various coordination mechanisms to support their ongoing information needs and reduce goal conflicts. This analysis examines information complexity problems and individual goals from the individual view of the single entities, which are summarized in their thesis and antithesis. Then a dialectic interactive view is assumed to describe goal conflict problems and the emerging synthesis, as is depicted in figure 5. (see figure 5 in appendix)

5.6.2. Evidence on coordination problems related to information complexity

Information complexity in EBU’s outsourcing relations can be observed from the individual view of GOBU and EBU, as shown at the conceptual level of figure 5, on its left-hand side:

- from the point of view of GOBU, information complexity problems arise from the high number of divisions interacting with a given sub-contractor;
- from the point of view of EBU (which is in line with ABU’s point of view), information complexity problems arise from the need for continuous adjustments between each division and its sub-contractor, due to different contingencies difficult to predict. These are mainly explained by the large number of product components and the lack of knowledge of the outsourced processes. These reduce the cognitive capability of the single business unit to predict adjustments.

The large number of EC’s divisions involved in the same outsourcing relation could put pressure on a certain sub-contractor increasing the amount and the frequency of information transmitted. Conflicting requests or instructions, from the different EC’s divisions, such as the assignment of productive capacity, the schedule of deliveries and so on, are examples of such information and an anarchical interaction between EC’s divisions and sub-contractors could create a situation in which information would very
frequently be exchanged, thus disturbing the operation process. The Short-
term Production, Planning Engineer of GOBU argued on problems arising
from the large number of divisions interacting with the same sub-
contractors. His argument supports the thesis of GOBU on the centraliza-
tion of the information flow, giving relevance to information available in
advance. This solution was feasible because information complexity prob-
lems can be faced more effectively by assuming a central point of view,
like the one of GOBU. In its thesis, GOBU proposes a heuristic strategy
(see table 1), assuming the underlying rules (acceptability, hypotheses test-
ing and modification of the considered objectives) as feasible.

However, this centralization of information flows, mainly conveyed by
the production plan, entailed other problems, described by the Process
Quality Control Engineer of ABU, who recognizes “the updating and the
synchronization of information flows” as “the most critical points in the
supply chain management”. These problems were mainly due to the variety
of product components and the multi-sourcing strategy of EC. To this re-
gard, the EBU’s Planning Manager provided examples of adjustments re-
quiring simultaneous interactions, and of the support needed to update the
production plan. Such coordination needs were perceived as problems
when the flows of information were not flexible, as was the case during the
period prior to the introduction of the new information system project. On
this point, the Financial Control, Business Planning Manager of EBU not-
ed: "each time EBU needs fresh information (...) EBU has to ask GOBU for
the information required or transmitted to the sub-contractor. Such a
mechanism is paralyzing and time wasting and makes adjustments use-
less”. Further problems were related to the lack of knowledge of the out-
sourced process, as noticed by the Planning Manager of EBU: “Because
the sub-con reports on wip (work in progress) volumes for each products’
component only weekly, that is on Friday, it could hide relevant problems
related to its production process. Specifically, once a bottleneck occurred
in the sub-con’s production lines interrupting the production flow (...). But
our problem is that we knew of that five days later, when we received the
production report on Friday. These managers’ remarks represent the coun-
ter-argument summarizing the antithesis advanced by EBU, which gives
relevance to information not available in advance. Particularly, EBU’s an-
tithesis attacks GOBU heuristic strategy, criticizing the feasibility of the
underlying learning rules: the modification of the considered objectives is
not fully appropriate and another learning rule should be introduced, i.e. the
modification of incremental parameters, underlying an incremental strate-
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To sum up, while the high number of EC’s divisions involved in each outsourcing relation entailed a centralization of information flow, acknowledging the relevance of information available in advance, the need for continuous adjustments required the opposite solution, the production plan being unable to anticipate all the adjustments to be made, thus giving relevance to information not available in advance.

5.6.3. Evidence on the individual goals of each entity

The theoretical framework suggests that individual goals of coordinating entities should be investigated considering factors related to the organizational role of each entity. Such factors are: the competences of the entities, the number and kinds of communications they receive, and the parts of the environment with which each entity communicates; the part of the organization where each entity works and its hierarchical level. Considering the different roles played by the coordinating entities within EC’s supply system, different individual goals can be firstly acknowledged to GOBU and EBU. The former was intended to play a central role in managing all EC’s outsourcing relations, which was justified by GOBU’s managers with lowering transaction costs. This represents the other GOBU argument to GOBU’s thesis, which gives relevance to information available in advance, as shown at the conceptual level of figure 5, on the left-hand side, regarding GOBU thesis’s box.

EBU’s managers, instead, were interested in maintaining the performance level of the business unit, avoiding that this could be lowered by outsourcing relations, for example in terms of growth in the stock levels and delay, which could negatively impact on cost levels and customer satisfaction. This can be seen as EBU’s individual goal in the EBU’s antithesis box of figure 5. During a meeting at EBU site, EBU’s managers justified their position arguing that for coordination purposes, business units had to directly interact with their sub-contractors without involving GOBU, underlining the relevance of information not available in advance.

Besides the individual goals of GOBU and EBU, which are relevant as arguments of their thesis and antithesis, sub-contractors’ goals should be taken into account as well, as an important coordinating entity influencing the coordination process. Sub-contractors’ goals cannot be easily defined, being sub-contractors a multi-actor entity. However, evidence on a specific
sub-contractor’s goal can be noticed from an episode that involved an Indian sub-contractor. During a visit at the sub-contractor’s plant, directed to explain the relevant delay in deliveries, the Planning Manager of EBU noted: “his concern to preserve the relationship with important customers, such as EC, induced the sub-contractor to accept all orders, thus overloading its productive capacity”. This sub-contractor’s individual goal was referred to by EBU’s managers as another argument justifying the need to directly interact with sub-contractors, so containing the central role of GOBU, namely EBU’s antithesis, as reported within the related box in figure 5.

5.6.4. Evidence on coordination problems related to goal conflicts

Goal conflicts between coordinating entities emerged from their dialectic interaction and can be observed at different levels of the EC’s system, as reported in the box on goal conflict problems, positioned at the conceptual level, in the middle of figure 5.

At the intra-organizational level, the interdependence between all the units composing EC’s supply system can be noticed from the arguments provided by the Short-term Production, Planning Engineer of GOBU, remembered earlier. As he noted, in case of direct interaction between EC’s divisions and sub-contractors: “a generalized delay in the work in progress can induce the managers of different divisions to put pressure on the same sub-contractor, competing with each other (...).” The potential for conflicts stemming from the dependence of EC’s divisions on common sub-contractors had been dealt with by a hierarchical solution, such as the constitution of GOBU that centralized the management of outsourcing relations and the required information flow by means of production planning, monitoring and corrective actions.

Hence, as a first result, the case shows that the degree of competitiveness, stemming from the dependence on common resources, could be observed within one of the partner organizations, namely among EC’s divisions. This competitiveness was an important source of goal conflict.

Moreover, at the inter-organizational level, the case shows goal conflicts between the partner organizations. In the previous section we reported what EBU’s Planning Manager referred on corrective actions regarding the lack of commitment of an Indian sub-contractor. It shows how, being EBU directed to gain efficiency, while the sub-contractor attached more importance to preserving the relationship, a goal conflict between the two en-
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tities emerged. It is opportune to notice how goal conflict between EBU and its sub-contractors is conditioned to the information complexity problems face by EBU, especially those related to the lack of knowledge of the outsourced process. In fact, as noticed by the Planning Manager of EBU: “Because the sub-con reports on wip (work in progress) volumes for each products’ component only weekly, that is on Friday, it could hide relevant problems related to its production process (...).” Since the result of this was the rise of opportunism, the information flows conveyed by production planning and other monitoring parameters were not sufficient to support ongoing adjustments, but ad hoc information and informal communication, as in the case of plant inspections, were also needed.

Another result can be thus drawn from this discussion. Because of goal conflicts between partner firms, information available in advance, such as that conveyed by a plan, was coupled with ad hoc information and informal communication. Specifically, this increase in the amount and in the frequency of information exchanged could be perceived necessary since no role was assigned to trust between the parties, as the case seems to show.

From the above discussion, in examining whether it is possible to agree on a set of relevant aspiration levels (coordination by program) and/or on limited actions to be taken, goal conflict must be considered: a) at inter-organizational level, between partner firms; b) at intra-organizational level, i.e.: among divisions competing in an outsourcing relation; between the two entities opposing thesis and antithesis, namely GOBU and EBU. The latter emerged from the interaction between GOBU and EBU’s managers during the corporate meeting: the former were willing to preserve the central role played by GOBU in managing all EC’s outsourcing relations, while EBU’s managers were interested in maintaining the performance level of the business unit. A synthesis was possible for the extent to which goal conflicts could be composed.

5.6.5. Evidence on coordination mechanisms as emerging synthesis

Our analysis, sketched in figure 5, attempts to explain the hybrid nature of coordination practices within EC’s system as a synthesis emerging from opposing GOBU’s thesis and EBU’s antithesis, as briefly summarized in what follows.

The two arguments underlying GOBU’s thesis can be reported in the following:
the large number of divisions interacting with a certain sub-contractor gives relevance to information available in advance for the scheduling of production and work orders among divisions;
- the central role of GOBU in the management of outsourcing relations must be maintained for lowering transaction costs. This central coordination gives relevance to information available in advance for the just mentioned purpose.

The above points justify the adoption of coordination mechanisms such as production plans, sub-contractors monitoring and corrective actions, as observable coordination practices enacting the established thesis. These practices are visualised in the left-hand side of figure 5 within the box positioned at the practical level, related to coordination mechanisms enacting GOBU’s thesis.

The two arguments underlying EBU’s antithesis are reported in the following:
- the large number of adjustments not predicted in each relation gives relevance to information not available in advance for those adjustments;
- the need to maintain EBU’s performance level and the need to control sub-contractors’ processes due to different sub-contractors’ goals give relevance to information not available in advance for preventing potential opportunism.

The above points explain the adoption of coordination mechanisms such as manual work orders and call offs, and informal communication that will be put into practice only if a synthesis is achieved.

The different individual goals among the entities of EC’s system leads to the following goal conflicts at both inter-organizational and intra-organizational levels:
- at inter-organizational level, goal conflict between partner firms arises from the potential opportunism of sub-contractors. This gives relevance to information not available in advance for preventing this opportunism;
- at intra-organizational level, goal conflict arises: a) from different business units competing in the same outsourcing relation, which gives relevance to information available in advance for the scheduling of production and work orders among divisions; b) from the different goals of the coordinating entities opposing thesis and antithesis, i.e. GOBU, intended to maintain its central role at EC’s system, and EBU, intended to maintain its performance level.
The possibility of a synthesis depends on the extent to which all conflicting goals can be composed. In the case under study it was possible to acknowledge relevance to both information available in advance and not. This emerging synthesis explains the hybrid nature of inter-firm coordination practices as a configuration of mechanisms comprising production planning, sub-contractors monitoring and corrective actions, manual work orders and call offs, and informal communications, which can respectively be related to the theoretical mechanisms of coordination by programs and mutual adjustments. These coordination practices are visualized at the practical level of figure 5 within the box in the right-hand side, related to coordination mechanisms enacting the emerging synthesis.

The above discussion is consistent with an a-centred and a-static view of EC’s outsourcing system, which comprises a central entity, namely GOBU, operating at the corporate level, and de-centred entities, namely EBU, ABU and EBU’s sub-contractors, operating at the business level. It is the dialectic interaction between EBU and GOBU that makes EC’s system neither centred, i.e. constrained by the higher hierarchical entity, nor de-centred, i.e. where the single entities would have large autonomy, but a-centred due to the interaction between the two opposing entities, whose dialectics drifts in an emerging synthesis, in line with an a-static view of change. Moreover, the a-centred character of the system is not confined to the intra-organizational relations between GOBU and EBU, but involves the inter-organizational relations as well. In fact, EBU’s sub-contractors are considered as relevant entities which influence the opposing thesis and antithesis. Hence, the emerging synthesis can be viewed as a drift for it is not possible to assess the extent to which each of the various entities has contributed to reach the final outcome, which is so not predetermined.
Appendix:

1. **Table 1** Coordination mechanisms as outcomes from coordination problems: a cognitive perspective. Our revision of Grandori (1984).

2. **Table 2** Empirical evidence on coordination tools and mechanisms prior and after the introduction of the new information system project.

3. **Figure 1** The integrative framework of inter-firm coordination as a dialectic process

4. **Figure 2** The centralization of information management in the outsourcing relations

5. **Figure 3** Extract of a work order browser at EBU related to outsourced assembly

6. **Figure 4** The parallel information management in the outsourcing relations

7. **Figure 5** The integrative framework of inter-firm coordination process applied to the case observed
## Tables and figures

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<tr>
<th>Information complexity</th>
<th>Goal conflict</th>
<th>Strategies</th>
<th>Choice rules</th>
<th>Search rules</th>
<th>Learning rules</th>
<th>Coordination mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is it possible to define a problem considering all relevant objectives, alternatives and consequences?</td>
<td>Yes</td>
<td>Optimizing</td>
<td>Value maximization</td>
<td>Computation</td>
<td>Modification of probability assessments</td>
<td>Price system</td>
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<tr>
<td>Is it possible to compare the consequences of single alternatives with aspiration levels?</td>
<td>No</td>
<td>Heuristic satisfying</td>
<td>Acceptability</td>
<td>Hypotheses testing</td>
<td>Modification of the considered objectives, alternatives, auxiliary decision processes, Information systems</td>
<td>Programs</td>
</tr>
<tr>
<td>Is it possible to compare moves with existing solutions at margin?</td>
<td>Yes</td>
<td>Incremental</td>
<td>Acceptability</td>
<td>Hypotheses testing</td>
<td>Ex-post modification of incremental parameters</td>
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<tr>
<td>Is it possible to observe action-outcome relations ex-post?</td>
<td>Random</td>
<td>Cybersinic</td>
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<tr>
<td>Is it possible to reach and to evaluate agreement ex-post?</td>
<td>No</td>
<td>Random</td>
<td>Random</td>
<td>Random</td>
<td>Random</td>
<td>Random</td>
</tr>
</tbody>
</table>

Table 1 – Coordination mechanisms as outcomes from coordination problems: a cognitive perspective. Our revision of Grandori (1984).
**Antonio Leotta**

|------------------------|-------------------------------------------------------------|----------------------------------------------------------|
| Production Plan        | a) the monthly production plan, containing the schedules for the production to be launched and the management of the productive capacity;  
b) the weekly production plan, which is transmitted each Monday and can only be updated weekly. | a) the monthly production plan, containing the schedules for the production to be launched and the management of the productive capacity;  
b) the weekly production plan, which is transmitted each Monday and can be updated during the week by means of manual work orders or manual call offs, containing instructions on adjustments on the quantity and the type of the devices to be produced, and the production schedule to be respected by sub-contractors. |
| Monitoring of Sub-contractors’ Activities | - the adherence between quantity and types of the devices programmed in the production plan and their actual values, with a target level of 98%;  
- the length of work in progress, with a target of 1.5 weeks;  
the level of delay, in terms of volume, with a target of 5%;  
- the adherence between the production quantity assigned in the production plan, the actual quantity and the assigned productive capacity, with a target of 95%. | - the adherence between quantity and types of the devices programmed in the production plan and their actual values, with a target level of 98%;  
- the length of work in progress, with a target of 1.5 weeks;  
the level of delay, in terms of volume, with a target of 5%;  
- the adherence between the production quantity assigned in the production plan, the actual quantity and the assigned productive capacity, with a target of 95%. |
| Corrective Actions     | “Service improvements” required by the business units and monthly communicated to GOBU, mostly using the aforementioned parameters and sub-contractor cost reports. The compliance of the sub-contractors to business units’ requests are appraised quarterly, leading to “quarterly operation review reports definition”. | “Service improvements” required by the business units and monthly communicated to GOBU, mostly using the aforementioned parameters and sub-contractor cost reports. The compliance of the sub-contractors to business units’ requests are appraised quarterly, leading to “quarterly operation review reports definition”. Other more specific actions are taken with the support of the divisions, whose managers and engineers visit the sub-contractors’ plant to transfer their know-how and competences. |

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**Table 2 – Empirical evidence on coordination tools and mechanisms prior and after the introduction of the new information system project**
Inter-firm coordination as an information problem

Fig. 1 – The integrative framework of inter-firm coordination as a dialectic process

Fig. 2 – The centralization of information management in the outsourcing relations
Fig. 3 – Extract of a work order browser at EBU related to outsourced assembly

Fig. 4 – The parallel information management in the outsourcing relations
Coordination process

**GOBU Thesis (relevance of information available in advance):**
- Information complexity problems: large number of divisions interacting with a certain sub-contractor;
- Individual goals: defending GOBU central role, lowering transaction costs.

**EBU’s Antithesis (relevance of information not available in advance):**
- Information complexity problems: large number of adjustments not predicted in each relation;
- Individual goals: maintaining EBU performance level; sub-contractors’ concern to preserve the relationship with EC’ units.

**Goal conflicts problems (Relevance of information available in advance or not: based on feasibility of on choice, search and learning rules):**
- between partner firms: efficiency improvements vs. preserving the relation; opportunism;
- among divisions competing in an outsourcing relation;
- between GOBU and EBU.

**Synthesis (GOBU – EBU)**
(new thesis: relevance of information available in advance and not):
- Information complexity problem:
  - GOBU: large number of divisions interacting with a certain sub-contractor; large variety of outsourced production components;
  - EBU: large number of adjustments not predicted in each relation;
- Individual goals:
  - GOBU: defending GOBU central role, lowering transaction costs;
  - EBU: maintaining EBU performance level.

**Coordination mechanisms enacting GOBU Thesis:**
- Production plan (updated monthly and weekly);
- Monitoring of sub-contractors’ activities;
- Corrective actions (required monthly).

**Coordination mechanisms enacting GOBU – EBU Synthesis:**
- Production plan (updated monthly, weekly and intra-weekly);
- Monitoring of sub-contractors’ activities;
- Corrective actions (required monthly and ad hoc during plant visits).

**Conceptual level**

**Practical level**

0 (Prior to the introduction of the project)

1 During the introduction of the project

Fig. 5 – The integrative framework of inter-firm coordination process applied to the case observed