Smart business networks: the evolution

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The intelligence of an information network is augmented by its functionality (its ability to distribute, store, assemble, or modify information). Transmission networks are technically complex, but business-wise they are "dumb" pipes that transport information without enhancing it. An information network augmented by formalized business relationships can be "smart"; it can improve the utility of information in multiple ways (that is synonymous with creating economic value).

Conversely, a lone transaction between two business partners rarely stands isolated, especially in an electronic commerce context, but the economic value accrues already then for both partners. New transactions can be created with the same or other partners, by cascading whole or parts of the same initial transaction, thus building a network of business relations which develops over time.

To address the two above paradigms, has been defined the concept of "Smart Business Network" (SBN).

A Smart Business Network is a developing web of people and organizations, bound together in a dynamic and unpredictable way, creating economic outcomes from quickly (re-)configuring links between these actors using shared communication and logistic networks [1,2]. Ultimately, smart business networks reshuffle the very notion of linear paths (or graphs) in business processes, to replace it with asynchronous interaction protocols and transactions between parties to the development, and embedding these inside the underlying communication network [3].

Business networks that are "smart", display quick connect and quick disconnect capabilities; they can pick the best capabilities from many business network actors, plug these capabilities together, and make these play in unison; they also control, or own, the business logic for multi-actor execution of business processes.

All three words in the title "smart business networks" are necessary. In management, the adjective "smart" is attributed to an action that is novel and different, hence thought of as innovative. Smart actions create remarkable, "better than usual" business results. "Smart" has a connotation with fashionable and distinguished, but also of being short-lived. The word "smart" in "smart business networks" is therefore not an absolute but a relative term. Smartness is a property whereby the network can create "better" results than other, less smart business networks or other forms of business arrangements. Smart Business

Networks develop not only because technology permits them to develop, but more significantly because markets and modern business competitiveness require such networks in order to survive and thrive [1]. Management attention then focuses on managing the network, on the processes for joining or leaving a network, and on processes by which to select suppliers from the network. We can now go one stage further and say that a fundamental competitive capability is to construct and manage a smart business network.

A "smart business network" (SBN) as defined above, has more operationally the following characteristics [3]:

- A group of participating businesses - "partners" or "actors" - that form the nodes, and this group is not necessarily visible to the outside;
- Actors are linked together via one or more communication networks forming the links, or lines, between the nodes;
- Actors are linked together as well by a shared ontology of bilateral attributed agreements or service level agreements (SLA's) of a temporary nature;
- The partners interact in novel ways they could not implement on their own, or possibly with other parties; this is the SBN network benefit, often linked to the mutual partner discovery and by smart network dynamics [4];
- The SBN is perceived by each participant as increasing his own value, even if individual overall goals/utility functions may be different; a simple illustrative case metric
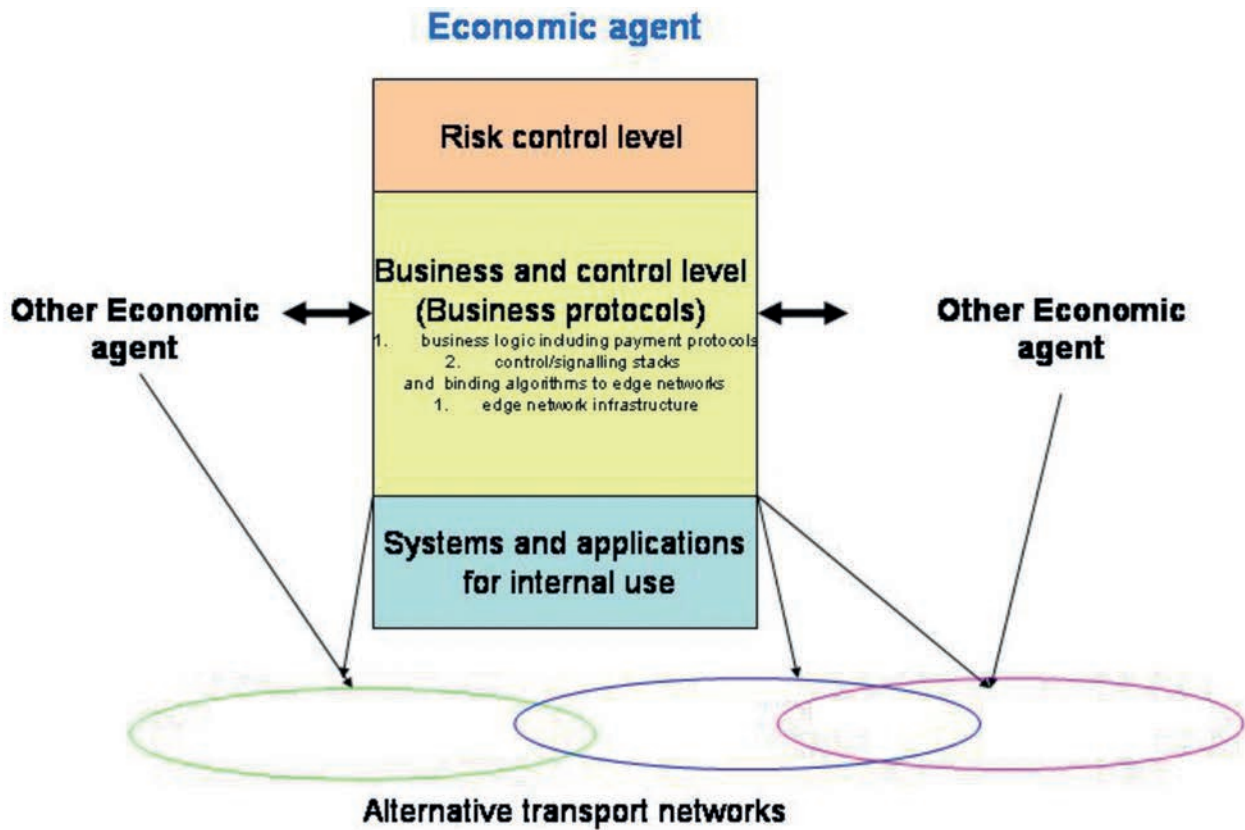
Figure 1: Smart business network at node level, showing the interaction architecture with other partners/nodes, using the interaction networks.

for the utility is the incremental turnover, profit and capacity utilization for each partner when he joins the SBN; the basic equilibrium concept providing governance inside the SBN is one of a non-cooperative Nash game, and not of a collaborative Pareto game. The forces of attraction and repulsion, which generalize the utility, must be measurable between any two partners of the SBN sharing the same ontology; for lack of further data, these forces are set equal to the business outcomes determined by a simple joint bidding auction;

- The SBN is sustainable over some time as a network, subject to agreed-upon termination rules;
- The SBN must normally be resilient if one or more businesses nodes in the network drop out, disappears, or malfunctions.

Figure 1 further specifies at the level of a given SBN partner, the 3-tiered node architecture, where the second level is the one linked to other SBN nodes, sharing as well communications and logistic networks.

Deployments

Whereas some physical supply networks exhibit the attributes of smart business networks, already today most of their attributes can be found for example in [5]:

- mobile content delivery networks, where quick-connect must be done in quasi real-time with content/DRM owners at end user request [3];

- electronic CAD networks, where building blocks get assembled with custom blocks, simulated, tested and prototyped;
- health management insurance networks where specific expertise in a localized way has to be assembled together with service delivery facilities such as clinics;
- mass customization services, such as video-on-demand subscription services, where the customer requests and their time profile shape the sequence of SLA's between content owners, re-purposing services, transport networks, and CRM systems [6];
- support services for software development [7];
- book routing services for bookshops [8]; Upload once for multiple indexing sites; Change inventory pricing for different services; Create subsets of books for various sites; Add information or web site links to each record; Check your data for completeness; Save hours per week/month;
- translation and internationalization services in the UK business [9].

A case from outsourcing in the high-tech sector

The case is a snapshot of the direct implementation of the above approach by one of the world's top management consultancies, to cater to a strategic goal, i.e. turn the company "A", a global high tech systems supplier to the communications & media operator sector, into a systems and service integrator benefiting from the outsourcing

trend amongst its customers. This goal had to be shared across the other parties in the smart business network, before they could possibly join it.

Case specification

More precisely, the case is about designing a smart business network around the field support, installation and consulting Division of the company "A", to allow "A" to achieve a significant worldwide market share in communications and media distribution network operations amongst its worldwide public operator customers, at a time where these customers change their core business; they shift from running networking services to the new core business of interconnecting networks they do not want to operate themselves any more. This can only succeed if, on a global scale, "A" can identify, select, use and sever links to a wide diversity of smaller technology or skills suppliers, many of them only operating in localized markets, or having de facto only one key customer. Vice-versa, these smaller suppliers find a resilient business in supplying "A" on a repetitive basis. As the outsourcing opportunities are time-critical, and as "A" wants to leverage its systems know-how (about its own products and those of selected other ones), financial terms are in effect of secondary importance compared to the ability to bid fast and comprehensively. Very often the track record of the smaller high tech companies may have been with competitors to "A" or with "A"'s own customers without any direct connection to "A". The potential number of partners in the total smart business network is about 500, with, on a country or regional basis, a minimum of three and maximum of about 15. The capabilities mapped out to model the business logic fell into the broad ontological categories of: skills sets, available staff on short or medium term notice, prior systems/product/tools experience, incentives and penalty conditions, geographical distance of pockets of skills sets to the operators' sites, etc.

Case discussion

The smart business network approach of Section 1 was found to be extremely powerful and relevant, first because of the shear automated exhaustive handling of all possible partner configurations, with their evolutions over time (from known track records into fulfilment horizons on the outsourcing contracts)[4]. Next, the possibility for "A", with help of the consulting company, to tailor the forces of attraction and repulsion between partners (usually via simple look-up tables expressing real capabilities) allowed to select efficiently the partners in different bidding situations.

One drawback was the learning time it took for traditional management consultants to adapt to this novel way of thinking; but actually this time was far less than the time "A"'s sourcing division would have taken to tackle the same volume of analysis. The other drawback was the reluctance by some of the 500 possible parties to disclose some capabilities and track record characteristics; but actually this was never a show-stopper, as information was readily available by indirect channels such as the business references these same companies were citing.

The outcome parameters were (cost, delay, quality) KPI's in supplying outsourcing contracts to operators as single but ever changing smart business networks. So far, over 10 joint bids to operators have not lead to questions on the methodology, but rather on the goals and organizations of the operators.

Implementation frameworks

To realize the three following properties of smart business networks:

- quick connect and disconnect between actors;
- pick, plug and play;
- business network specific business logic.

Fortunately some open standards developed over the last 10 years offer the required tools. They include BPM process specifications, OMG Model driven architecture (with its evolution), open mediating ontologies (such as SymOntoX), XML specifications, and Web Services [10]. A number of commercial tools also exist, such as e.g. Microsoft BizTalk, IBM WebSphere, BEA WebLogic or Tibco ActiveEnterprise. At the network level, and this was one of the key contributions to smart business networks, the idea is to use extensions to the IP signaling protocols (such as DIAMETER), by the IEEE P1520 network interface standard, to carry out the asynchronous partner search and matching. BPM protocols between partners have to be tailored to a domain, and [3] provides a simple example in the form of SNMP Simple Network management protocol, with a payment function and due authorization when the required resources are made available.

The next frontier: managing intellectual property rights as smart business networks

Today, more and more joint ventures or co-developments extend the notion of individual supply transactions to reach the development of the intellectual property rights (IPR) supporting a joint product or service development; sometimes even, the above discussed business logic (Figure 1) becomes an element of the intellectual property of the smart business network. One of the difficulties is that a lot of legal and technical expertise must go into the crafting of the intellectual property right claims and their ownership. At the same time, co-development should not be at the expense of development times and of blocking the licensing to third parties. This is especially true in the case of SME's who want to offer their IPR to some parties, while needing some from yet other parties.

The Swedish company Upgötva AB [11] has embarked into a setting up an IPR brokering platform using basic IPR attributes filled out by the IPR owners, and managing ontologies and matching tools to create smart business networks. In this way, third parties can discover not just what IPR is available, but also the complementary needs inside a product or service business network.

Conclusion: risks involved in smart business networks and some research challenges

As process events can be linked very quickly, and economic agents may recompose themselves and/or their capabilities, the dynamic resource optimization across many economic agents can become overly complicated. We suggest that some genetic and bio-informatics algorithms may be useful to realize the corresponding attraction-repulsion selection, and to execute in a distributed way the recalculations of the business benefits inside the shared SBN network.

Smartness may emerge spontaneously and not be intentionally designed; and conversely, if designed smartness may not deliver its promises, it may enhance some business risks. While much theoretical and experimental research is still needed to identify the causal relations leading to smart business network risk formation, some of the underlying forces are the following [12]:

- Bounded group rationality that limits the actors' group mind sharing in a same way as for individuals;
- Dynamic emergence and decay of key information brokers, information creators, and information users. Measurement on SBN networks shows that most nodes can be categorized as one of these three types;
- Sometimes lack of agreed upon and transparent confidence, governance, and trust maintenance procedures inside a SBN;
- Changing behaviors due to the SBN networking itself; cases have already shown that when a company organized itself as a smart business network across business units, it ultimately disappeared as the entities felt their accountability, initiatives, discipline, focus and expertise did not require the same attention as this was "taken care of by others in the network";
- What should be the granularity of the operations at each smart business network partner when networked? Too high granularity leads to overlaps, inefficiencies and conflicts, while too low granularity reduces innovation and flexibility; the notion discussed here is not the one of modularity in a linearized supply chain, but instead about the range of the specialized activities at each business partner in a smart business network, which can be formalized by task graph decomposition within a network.

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