Business Intelligence at the Crossroads: Convergence or Confusion Ahead?

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Abstract. *Business Intelligence (BI) innovation may have stagnated given the combined forces of a down economy and the mergers and acquisitions that have reshaped the BI vendor space. To catalyze needed innovation, a new challenge is issued that focuses on advancing global services growth. That challenge is contextualized as one requiring piecemeal advancements within specific service industries before generalization to aggregate service categories like B2B, B2C and self-services. While advocating this stepwise approach, the concomitant emergence of what is referred to as the 'servitizing' of BI is addressed. This refers to notions of 'analytics as a service,' 'data warehousing in the cloud,' 'elastic data marts,' etc. While applying the service metaphor to BI (as in servitizing BI), and while addressing growth in the global services economy, there will be significant confusion surrounding BI innovation in the years ahead. Three case studies are used to demonstrate the advocated investigative approach.*

Introduction

Many believe that innovation in the Business Intelligence (BI) area has stagnated as acquisitions and mergers within the BI vendor space have required time for assimilation. Ironically, economic distress in many global markets has provided that needed time; the question is how well vendors have used the time to innovate. The expectations are high; BI has served companies well in an era of downsizing and cost-cutting. But when the global economy emerges from its dire straits, organizations must plan for international growth that is predicted to be driven by tough minded, value-focused customers. On one hand, today's vendor landscape will offer new BI platforms that have converged into what will be more robust organizational IT infrastructures. That convergence portends BI capabilities for new levels of decision support, performance management and effective business process execution. Such convergence will target simultaneous support for global agility, mobility, predictive analytics, etc. On the other hand, being locked into a BI solution because the solution is tightly coupled with existing infrastructure might stifle an organization's ability to differentiate its products, and it might throttle fast reactions to hyper-competitive markets overwhelmingly composed of value-conscious customers.

BI is at a crossroads, and the purpose of this paper is to provide one way to begin examining BI futures. Will the post-mergers and acquisitions era lead to a healthy and sustainable convergence? Or will confusion reign for some time to come – with disruptive innovation being a likely outcome? Could confusion be exacerbated by independent business unit deployment of distinct BI capabilities and localized unit-level strategies for parlaying BI benefits to target service economy growth? It is likely that recent discussions regarding the 'servitizing' of BI will lead to rethinking historical assumptions related to fundamental tenets of both data warehousing and predictive analytics. Could this latter case of servitizing BI foster a profitable shift from a product/goods focus to a service focus in how BI capabilities are designed, developed and deployed? Could it address how to deploy BI for all types of services and for the emerging variety of customer touch-points that need to be integrated in a sophisticated way in order to industrialize services? With proof-of-concept applications

existing in areas like "analytics as a service," "elastic data marts" and "data warehouses in the cloud," the servitizing of BI is well underway. It provides a new vantage point for needed research and innovation in the shift to a services economy.

When facing a crossroads, an aerial view can provide insights. Such a view is possible if we consider three generic global business strategies. The resulting contingencies might suggest that for each strategy, one road for BI may be more appealing than another. Further, if we dissect those strategies in terms of a services growth priority lens, a more complete picture is possible. Since the growth of services represents the most widely predicted next major wave, it represents an important focus. Finally, if we consider the BI landscape in light of these contingencies, a research strategy is needed in order to realize incremental and disruptive innovations. Three case studies will serve to illustrate this point; one a project at American Express, and two others at Intel [1].

BI Futures and Generic Global Strategies

Three generic global business strategies [e.g., 2] are relevant to the most significant BI futures. For what is referred to as an aggregation strategy, BI as tightly coupled to an organization's core infrastructure is argued to be an important capability for product growth strategies. For local adaption, a loose coupling is advised, and unit-level independence as advanced through such a BI approach is argued to be better aligned. For the arbitrage strategy, a hybrid approach is relevant – one that exposes several underlying benefits to the servitizing of BI. For each strategy, the demands of the increasing prevalence and profitability often associated with services provide new challenges. These challenges may bode better for certain BI servitizing approaches. Overall, the notion of shifting from a predominantly product or goods-based focus to one where services can play an increasingly important role is an important target for BI innovation. For this paper, global services are defined as "deeds, performances and/or efforts conducted across national boundaries in critical contact with foreign cultures" [3]. In general, a service is thought to involve the exchange of an intangible; consumption and exchange are simultaneous and services are considered to be perishable.

In aggregation, global firms strive to standardize processes and replicate them to support growth. When processes are perfected and costs are optimally managed, those processes can be replicated in new markets. BI plays a central role in tracking, exception reporting, quality control, etc. Performance management can be leveraged to support effective supplier relationships, and the entire value chain can be more transparent to all involved. Predictive analytics can address improved operational performance as decision processes are embedded where feasible. This results in labor savings and the further streamlining of processes. But what if processes aren't so standardized? Such is the case with many global service companies where, for example, each service encounter might require a different processing time dependent on the nature of the encounter and its complexities. Overall, international growth strategies that rely on aggregation strategies for growth in the services area can face difficulties. Can BI innovations address these difficulties?

In contrast to aggregation, local adaptation implies designing tailor-made strategies for targeted entry into specific markets. For example, such a strategy may imply designing product features, advertising, pricing, etc. for a market characterized as a geographical region and/or a common demographic group. Local adaption in a services context may be more difficult than in the products/goods context. This is likely to be the most costly model of entry, but that may be offset by utilizing technology (e.g., Internet, e-commerce, etc.). Overall, international service growth strategies that rely on local adaptation are expensive, they often can only be addressed by large, strong multinational corporations, and they differ from product growth approaches because the level of attention required for adaptation is much more arduous. Can BI innovations address these issues?

Labor arbitrage as a third category for global services growth can often imply the shifting of service work from one international workforce to another international workforce such that labor costs are minimized. In the case of products, manufacturing processes are often distributed worldwide as new factories are built and workers from a country where a factory has been in operation can train new workers for the new factory. In some cases, labor arbitrage is required for global entrance as legal arrangements for selling goods in a foreign country requires a certain level of local

production. Technology has already fostered a significant degree of labor arbitrage in the services area, but production processes are not involved. From call centers to medical diagnosis, and from tax preparation to all forms of financial services – labor arbitrage has been both done well, and it has failed in many cases. How can BI be leveraged to address common pitfalls?

It seems clear that global growth strategies are important determinants for future BI innovation. Clark et al. predicted early on that a single unifying theory for guiding service internationalization would likely not surface [4]; the same is therefore likely true for the internationalization of BI in the services area. However, it is clear that this is an area in need of BI innovation. Of course, there are a host of other factors relevant to strategic choices for international service growth: host government regulations, limitations to foreign ownership, financial and fiscal controls, etc. [4]. In the next section, additional aspects related to the service industry and generic types of services are considered as additional determinants.

BI Futures and Service Industry Typologies

Very early in their analysis of the U.S. economy, Browning and Singelmann studied the shift of the labor force from a predominantly agricultural economy to one where services were becoming a dominant focus [5]. In the course of their analysis, they identified and classified service sectors. This classification can be useful for providing a needed contextualization for innovation in BI directed at global services growth. Today, it is typical to refer to three generic classifications: Business to Business or B2B services, consumer services (B2C), and self-services. These three labels cut across many of the distinct service industries Browning and Singlemann identified in their research. They define transformative industries as those most closely related to specific products or goods. Services associated with industries like construction, food, textiles, metal, machinery, chemical, utility and other miscellaneous manufacturing contexts are often grouped together given their relationship to transformations of raw materials. In historical transformative industries, there are internal or within-organization services that support transformation processes. Here we generalize

these types of internal services as "Services inside the firm." Although some services can be inside the firm, they might also be between firms. "Business services" like accounting, consulting, design, advertising, information technology, maintenance, etc. are examples of such services. Browning and Singlemann group finance, banking, insurance, legal, real estate and other similar services under the banner 'Marketed services." They label as "Distributive services" those related to wholesale, storage, retail, transportation, communications and other similar services. "Nonmarketed services" are traditionally those that include education, health, social welfare, public administration, police, legal, fire and defense. While it is common today for education and health, for example, to be included in Marketed services, there still remain services associated with these areas that are not marketed. Finally, "Personal services" are those including domestic, hotel, entertainment, repair services, etc.

Innovation Implications

These six service areas may well be targets for customized BI innovations. This is the case even while there have been many successful global service industries that rely on BI. That said, the competition in the services area will be heating up as more and more countries shift from agricultural and manufacturing-based economies into the area of global service. Since the three categories of B2B, B2C and self-services cut across service areas, it is possible that innovations made possible by BI can be generalized to one or more of the areas. For example, if a particular BI innovation addresses Marketed and Distributive services, then that innovation may well have a significant impact on all B2B services.

When combined with global strategy determinants, service industry types may well be targets for BI innovations. For example, an organization relying on an aggregation global strategy to advance distributive services may find some particular BI innovation to be a disruptive innovation, while for another combination, that same BI innovation may have little impact. It is through this set of contingencies that innovations are likely to take shape. First of all, piecemeal innovations by generic strategy and industry type need to precede the generalization of those innovations to generic service classifications

(B2B, B2C and self-service). And innovations relevant to generic service classifications need to preceded extrapolation to broad-sweeping generalizations that claim to have impact on the entire global services industry.

This contingency approach provides a research strategy leading to innovations for dealing with the complexities of shifting from products to services in global service industries that make use of BI. Without the piecemeal approach, it is likely that confusion will reign in this area even as BI vendor consolidation has peaked, and product/goods producing firms incrementally refine BI strategies – but discover that their refinements are not easily transferred to the services economy. In the following sections, three case studies are provided that exemplify this piecemeal approach to advancing innovation.

Case 1: Intel Value Chain Analysis – A Services Approach

In this first case, Intel Corporation was seeking new way to connect their entire supply chain to customer touch points. A problem had been the fact that retailers of personal computers equipped with Intel chips were handling customer complaints that may have involved issues that could have been dealt with through collaboration among a variety of supply chain partners. By extending their supply chain relationships to customer touch points, Intel sought to better manage the entire value chain, and to have customer experiences provide needed feedback into all of its inter-organizational business processes. Intel researchers worked with Professors Demirkan and Goul of Arizona State University for several years to develop a strategy for using BI and performance management to address the problem [e.g., 6]. Together, the team developed a common business semantic to be shared throughout the value chain, leveraged master data management to translate independent performance measures into a scorecard that all organizations could see and understand, and predictive analytics on the collective data provides important insights. This case exemplifies a shift from a product to service focus that relates to transformative industry services fitting into the business services and B2B context. Intel is known for its excellent application of the aggregation strategy in addressing global markets. The main innovation involved servitizing BI through master data

management services that provide needed information for a value chain-wide consumption. The other innovation involved the creation of common business semantics that could be understood and used by all value chain participants.

Case 2: American Express BI Group – Service-Oriented Software Development

In this second case, the BI Group at American Express' Global Card Services Division had recently come off a wildly successful new BI report that was supporting sales of its global card services to corporations. The new BI report linked American Express' travel and financial data warehouses in a way that enabled tracking of corporate card holders who initially charged their flights for business travel at the appropriate coach class, but who, upon arriving at the airport, upgraded to first class. Called 'Zap the Gap,' the report provided organizations that took advantage of American Express' corporate card services as an extremely low cost way to police their travel policies. The report was provided in a self-service portal for organizational corporate card customers. With this new and exciting service, the BI group received a significant number of requests for similar reports that could be leveraged to expand corporate card services sales. Unfortunately, the developers with the knowledge of how to combine the two warehouses and provide the self-service reporting capability were inundated. This led to a call for research to address bottlenecks such as those that emerged in this situation. Researchers from Arizona State University (H. Demirkan, M. Goul, M. Keith and J. Nichols) worked with American Express' Global Card Services BI Group to develop a new approach [7, 8, 9]. Complicating the situation was the fact that the company frequently outsourced portions of BI software development, and that outsourcers were a constantly changing mix of service providers. In this case, a BI approach was developed to track projects in a way that required outsourced developers and in-house development teams to report performance in much the same way as in the Intel case above by using a common business semantic. However, what was unique in this context was that knowledge management approaches were utilized to better inform development team sharing of important knowledge related to the most critical tasks. In this context, the researchers used both traditional

approaches and social network analysis approaches to prescribe a novel service-oriented software development methodology. These innovations dealt with a firm that follows an aggregation strategy that also makes use of a labor arbitrage strategy- all in a B2B financial services context. The main innovation was in servitizing the BI development process itself, applying performance management to that process, and by combining these strategies with customized knowledge management and social networking approaches. The deployment into a self-service portal was an important aspect of the case.

Case 3: Intel Corporation – Virtualization and Cloud Computing

Virtualization of computing resources could have a big impact on Intel's market. In preparing for a future characterized by increased virtualization, Intel coined the phrase, 'Service-oriented Infrastructure - SOI.' Many today refer to this as 'Infrastructure as a Service or IaaS.' If organizations were to make use of virtualization in a cost effective way, Intel reasoned that sourcing infrastructure in the cloud should be informed by historical business process executions. For example, consider an organization's infrastructure as a stack with business processes at a top layer, service-oriented software as a second tier, and SOI at the bottom layer. Then, as a business process execution is processed in the stack, it is sourced by software services, and then sourced by infrastructure services. Software may execute outside the stack – in the cloud. Similarly, infrastructure can operate in the cloud to execute software services. To decide what resources were needed in the cloud at this lowest layer would require forecasts. Intel collaborated with Arizona State University (Demirkan and Goul) to address this architectural issue [10]. As in the cases of both the earlier Intel work and the American Express work, the research effort began by developing a common business semantics to enable performance management up and down the infrastructure stack – and to enable negotiation with cloud providers for needed resources. A major need in this case was to utilize BI to provide predictive analytics for informing the negotiation processes with the cloud. A major innovation was to leverage servitized BI to support automated negotiation between the SOI layer and the cloud. This case fits the context of a service globalization strategy that advances cloud computing through aggregation. There is some sense of arbitrage, but in the context of automating the negotiation for the lowest cost compute resources. The case involves a combination of 'Services inside the firm' and 'Business services,' but certainly not in the traditional sense of these services. In fact, with the advent of cloud computing, the case addresses the creation of entirely new service markets that didn't exist before. However, findings still address the B2B services context, and they are therefore important and can be combined with other B2B services context to ascertain possible generalizations.

Three Cases Generalized for B2B Service Contexts

In these three cases, a common element was the creation of relevant business semantics for innovative B2B service contexts. This involved ontology engineering in each case, and for every case, a different twist on servitizing BI was pertinent. This implies that much more work is needed to generalize findings beyond the global strategy contexts, service typologies considered and the BI servitization strategies considered. However, characterization of these dimensions by case can foster a cumulative research agenda that can realistically result in disruptive innovations. There is much hard work ahead, but without some direction and clarity, confusion will definitely reign.
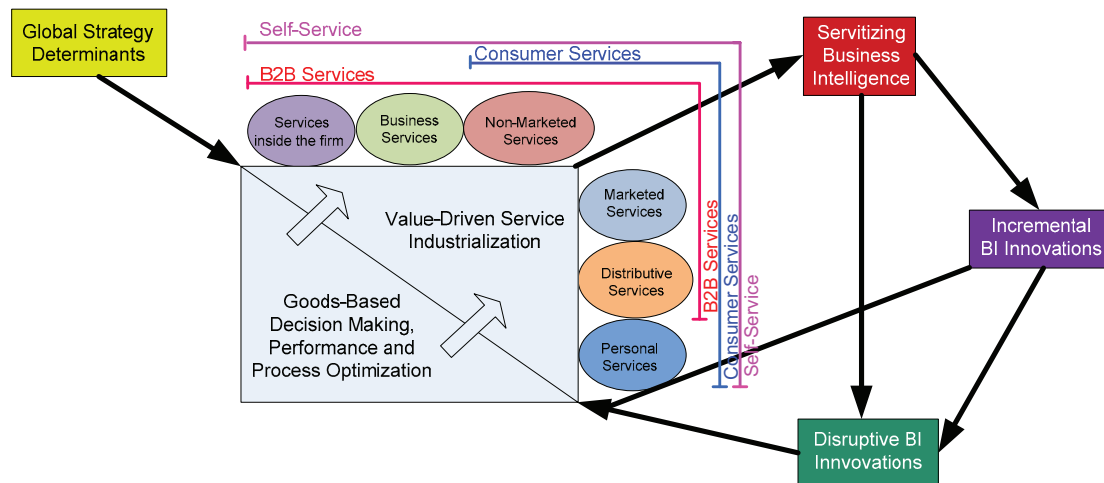
Summary

Figure One summarizes much of what has been discussed above in a single diagram reflecting the shift to value-driven services from a predominantly goods-based approach to BI. That shift is referred to as the change to 'Value-driven Service Industrialization.' The servitizing of BI is implied as an enabler, but net impacts remain an unknown. Global strategy determinants are labeled as having a direct influence on the shift, as are incremental and disruptive innovations that ensue from case by case analysis. Service typologies are represented, with respective groupings of service types representing a first level of possible generalization.

The purpose of this paper is to provide one approach for articulating how cumulative research findings can make inroads into BI

innovation. The decision to address the service industry – while confusing when considering the servitization of BI at the same time – remains an important challenge. This is particularly true in the case of global B2B service contexts – the context where three cases have been described along with a summary of the respective findings. While there are many limitations to the approach prescribed, providing some needed order to research discussions and the elaboration of research findings remains an important topic of concern [e.g., 11]. As progress is made, BI Futures that have been based on sound underpinnings will serve both future researchers and BI workers well.

Figure 1: Summary of BI Advancement in the Shift to Global Services

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