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Enabling Front-Office Transformation and Customer Experience through Business Process Engineering

The scope of business processes has been traditionally circumscribed to the industrialisation of enterprise operations. Indeed, Business Process Management (BPM) has focused on relatively mature operations, with the goal of improving performance through automation.

However, in today's world of customer-centricity and individualised services, the richest source of economic value-creation comes from enterprise-customer contacts beyond transactions. The need to make sense of a mass of such touch-points makes process a prevalent and emerging concept in the Front- Office of enterprises, including organisational competences such as marketing operations, customer-relationship management, campaign creation and monitoring, brand management, sales and advisory services, multi-channel management, service innovation and management life-cycle, among others.

While BPM will continue to make important contributions to the factory of enterprises, the engineering of customer-centric business processes defines a new field of multi-disciplinary work focused on serving customers and improving their experiences. This new domain has been dubbed Business Process Engineering (BPE) in the concert of IEEE Business Informatics.

This paper addresses the main characteristics of BPE in comparison with traditional BPM, highlights the importance of process in customer experience as a key goal in Front-Office transformation and suggests a number of new research directions. In particular, the domains of process and information remain today disconnected. Business Informatics is about the study of the information process in organisations and thus, reuniting business process and information in enterprises is a central task in a Business Informatics approach to engineering processes. Among other activities, BPE is chartered to close this gap and to create a suitable business architecture for Front-Office where organisational and customer behaviour should guide and benefit from emerging data analytics techniques.

1 Process is out of the Industrialisation Box

Business process has been at the center of the stage in both research and industry for several decades. Under the brand of Business Process Management (BPM), business process has attracted a great deal of attention from many practitioners and scholars. BPM has been defined as the analysis, design, implementation, optimisation and monitoring of business processes (Dumas et al. 2013; Franz and Kirchmer 2012; Rosenberg et al. 2011; Schönthaler et al. 2012; Sidorova and Isik 2010). Aalst et al. (2003) defined some targets of BPM: "*. . . supports business processes using* methods, techniques, and software to design, enact, control and analyse operational processes involving humans, organisations, applications, documents and other sources of information."[1]

While the above definitions are quite comprehensive and broad, in reality most BPM research and industry activity has grown upon the motivation of reducing operating costs through automation, optimisation and outsourcing. There are a several Schools of thought and practice (such as lean, lean sixsigma, and others (Andjelkovic-

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[1] Aalst et al. (2003) exclude *strategy processes* from BPM, a remarkable pointthat will be revisited in more depth later in this paper.

Pesic 2007; Andjelković Pešić 2004, 2006; Näslund 2008)) and a myriad of related literature in the last 40 years that serve to illustrate the focus on cost contention. Around the middle of the past decade, T. H. Davenport (2005) stated in a celebrated Harvard Business Review paper that processes were being "*analyzed, standardized, and quality checked*", and that this phenomenon was happening for all sort of activities, stated in Davenport's own terms: "*from making a mouse trap to hiring a CEO*". The actual situation is that industry investment and consequential research have stayed much more on "trapping the mouse" than in differentiating customer services through innovative and more intelligent processes, let alone hiring CEOs. This may be explained partly from Davenport's own statements in 2005: "*Process standards could revolutionize how businesses work. They could dramatically increase the level and breadth of **outsourcing** and **reduce the number of processes that organizations decide to perform for themselves***" (bold face is added here for emphasis).

With the advent of different technologies such as mobile, cloud, social media, and other digital capabilities that have empowered consumers, the classical approach and scope of business process have begun to change quickly. Organisations are adopting new operating models (Hastings and Saperstein 2007) that will drastically affect the way processes are conceived and deployed. As stated by many authors in the last four decades, business process work is supposed to cover all competences in an organisation, irrespective of the specific skills from human beings participating in such operations. However, in an unpublished inspection of about 1,300 papers conducted by the author and some of his collaborators[2], most process examples shown in the literature deal with rather simple forms of coordination of work, mostly exhibiting a flow structure and addressing administrative tasks (like those captured in early works on *office information systems*).

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[2]The co-authors are L. Flores and V. Becker both from IBM Corporation.

Furthermore, the examples provided usually deal with rather idealised operations, probably offered as simple examples with the purpose of illustrating theoretical or foundational research results (Aalst 2004; Aalst and Hee 2002; Aalst et al. 2003; Yan et al. 2012). Thus, radically simplified versions of "managing an order", "approving a form", "processing a claim", "paying a provider", "delivering an order" etc. are among the most popular examples of processes found in the literature.

The lack of public documentation of substantial collections of real-world processes is remarkable. Houy et al. (2010) both confirmed the dominant focus on simple business processes and also suggested potential practical consequences of related research: "*... there is a growing and very active research community looking at process modelling and analysis, reference models, workflow flexibility, process mining and process-centric service-oriented architecture (SOA). However, it is clear that existing approaches have problems dealing with the enormous challenges real-life BPM projects are facing [...] Conventional BPM research seems to focus on situations with just a few isolated processes ...*". Of course, the list of available real-world processes would be a lot richer if one included the set defined by enterprise packaged applications (Rosenberg et al. 2011). However, this comprehensive collection is proprietary because it constitutes a key piece of intellectual capital coming from software vendors or integrators in the industry.

The traditional focus on process has also raised much controversy. At the S-BPM ONE Conference in 2010, a keynote speaker (Olbrich 2011) remarked: "*Let me be as undiplomatic as I possibly can be without being offensive [...] The academic community is as much to blame [...] as the vendors of BPM systems, who **continue to reduce the task of managing business processes to a purely technological and automation-oriented level***". While other authors in the same conference debated "who is to blame" very animatedly (Fleischmann 2011; Singer and Zinser

2011) it is important to highlight that the statement from Olbrich (in bold face above for emphasis) reinforces that BPM has mostly followed the obsession of automation and optimisation by means of Information Technology.

A detailed inspection of the extant literature confirms that business process work has been devoted to a rather small fraction of the actual variety and complexity found in enterprise behaviour. This behaviour enacts many valuegenerating capabilities that organisations cultivate based on skills provided by their own workforces and through rich interactions with other enterprise stakeholders, particularly customers. The following points offer a simplified summary:

(1) Business process research in Computer Science has been traditionally focused on certain classes of enterprise operations, mostly involving simple coordination mechanisms across *tasks.* This type of coordination and the overall behaviour represented in underlying models reflect very much an "assembly line" where work is linearly synchronised to deliver a desired artifact or outcome. BPMN, emerged from OMG as the industry standard for business process modelling is a good illustration of this point. Simplicity of the choreography is ensured by removing any form of overhead in communication when moving from one stage to the next. Unlike other more complex business processes, many software applications do have this simplified structure. In fact, a trend since the early 2000's is to separate the specific application logic from the coordination / choreography needed across modules, and both of them from the actual data contained in a data-base management system. Different foundations and a plethora of languages have been created to capture this semantics of coordination such as Business Process Modelling Notation (BPMN), Business Process Execution Language (BPEL), Unified Modelling Language (UML), Event Process Chain (EPC), Petri Nets, etc.

(2) Resulting process models have typically yielded the form of a "workflow" (Sharp and McDermott 2009; White 2004). This means that the activation of a task in the assembly line only occurs when certain predefined events take place, one or more previous tasks are completed and their produced artifacts transferred to the next task in the pipeline for continuing "the assembly". In fully automated systems, like software applications, this is a good abstraction (see Fig. 1). On the other hand, in actual business processes where humans participate or supervise the individual tasks, workflows do not always capture the actual pattern of work, including the contractual commitments made across role-players.

Consequently, IT systems used to implement such workflows, called "Business Process Management Systems" (BPMS) in IT jargon[3], are not suitable to communicate the nature of work to business stakeholders. This point has been extensively addressed in recent Enterprise Engineering work (Dietz et al. 2013), such as DEMO and related contributions (Albani and Dietz 2011; Aveiro et al. 2011; Barjis et al. 2009; Proper et al. 2013). The issue of clarity was brought up by Dietz eloquently during a key-note entitled "Processes are more than Workflows" in the 2011 KEOD Conference: "*With modelling techniques like Flowchart, BPMN, Petri Net, ARIS/EPC, UML and IDEF you get easily hundreds of pages of process diagrams. Nobody is able to understand such models fully. Consequently, nobody is able to redesign and re-engineer a process on that basis*".

Beyond communication issues, the distinction of contexts between an organisational design

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[3]The term BPMS is somewhat questionable because it implies that these IT systems implement processes while they actually do so only for very special types of processes, i.e., workflows. Thus, the earliest denomination of Workflow Management Systems (WMS) is more adequate. As an example, *Cases* emerged later in the software industry and model more complex processes. The term Case Management Systems (CMS) has been used to distinguish them from BPMS. This incorrectly implies "cases are not business processes".

concern and an IT concern should also be carefully addressed. In the workflow abstraction, the potential role-players assigned to the execution or supervision of the individual tasks will be "idling" unless they get activated through the pipeline. This model of reality is well-suited to fully automated tasks (like those realised by software) but unsuited to other situations in organisations where humans take part of the process execution.
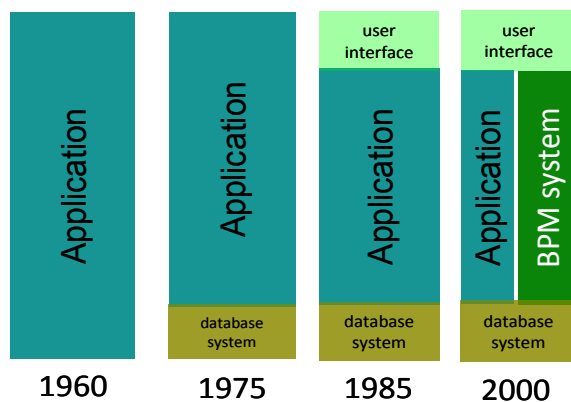

Figure 1: The evolution of information systems development and the role of BPM systems in the newest generations of software (from Aalst et al. 2003).

Indeed, the factory model of operations captured into a workflow implies that people are actually "doing nothing" unless their "activation" occurs by the preceding tasks in the pipeline. The latter is far from modelling accurately the reality of work in most enterprise processes.

(3) The tradition of business process management works on the assumption that the investment made in optimally designing a process will be recovered through the repeated application of the process for a long-enough period of time. The principle is that economic benefits will accrue from accumulated cost reduction obtained by the application of the optimised process over and over again. This approach reflects a true *'factory'* in the conception and modelling of organisational behaviour. Furthermore, the idea of perfecting the process with such an effort paying off through hundreds of thousand repetitions

or even millions of interventions done with the same process is adversarial to the business need of introducing modifications. As organisations have been progressively more affected by sudden change or involved in operations where change is a common requirement this type of *factory optimisation* does not work. In fact, rigidity of process models has been a long-standing and bitter finding. More recently, the broader issue of process evolvability in the presence of continuous change has been the subject of solid research, including a recent PhD thesis (Nuffel 2011) and references therein.

(4) Implicitly or explicitly in the traditional approaches to business process, it lies the Taylorian principle of replacing individuals by applying automation whenever possible. As in other business theories that build on a "dehumanisation" of enterprises, the consequence is that the role of humans as sources of value-creation in processes is ignored. The connection of this foundation and BPM work has been openly recognised by Van der Aalst in his recent review of a decade of Business Process Management conferences Aalst (2012): "*Adam Smith showed the advantages of the division of labor. Frederick Taylor introduced the initial principles of scientific management. Henry Ford introduced the production line for the mass production of black T-Fords. It is **easy to see that these ideas are used in today's BPM** systems*".

In close connection to this moral coming from certain economics and business schools, it also resides the goal of avoiding *variation* of the process by all possible means. This good idea originally coming from manufacturing practices (i.e., reducing variation as a means to controlling quality and cost of the resulting production) has been translated to other forms of operations (such as *services*) where variation is inevitable when interaction with non-automated agents becomes an integral part of the actual production process.[4]

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[4]Most call centers begin all their interaction with customers by following pre-established routines. In some cases, this may disgrace the effectiveness of the service and satisfaction of the caller. A known example is when reasonably

Inevitable process variation is a significant sign of 'lost control', as organisational capabilities go from the tangible to the less tangible. As said in Le Clair (2012), *the less tangible the capability, the more control will be ceded to the customer.* The tradition of BPM work contrasts sharply with Enterprise Engineering (Dietz et al. 2013), a theory in which humans are seen as a precious source of value, particularly for achieving improvements and differentiation. In particular, all processes involving interaction with customers offer this opportunity (services researchers often call this concept "co-creation").

(5) It is important to recall that existing *process classifications* such as the Process Classification Framework (Process Classification Framework (PCF)) reveal common areas of work in organisations that do not follow the BPM tradition in the sense that they do not represent work amenable to workflows. Indeed, PCF is a standardisation effort in different industries that includes many non-factory areas of an enterprise. Consequently, these operations are not adequately addressed by the application of existing BPM research, methods and tools.

The clarification from Van der Aalst and his collaborators when excluding *strategy processes* from the scope of their work was an excellent and very early sign, although "strategy" should not have been the only area excluded from the scope of their contributions. Indeed, there are other critical business processes in enterprises beyond "strategy" that do not fit workflow models, Petri Nets, BPMN, or related instruments popular in Computer Science (Sanz et al. 2012). Specifically, these other forms of organisational behaviour beyond '*the factory*' involve complex activities carried our by humans in collaboration with one another and with the support of technology in ways that are observable and may also be captured into process models. This point can also

be easily illustrated by using some of the Process Classification Framework (PCF) content.

While some people may argue that this framework may arguably be called a process architecture (Eid-Sabbagh et al. 2012; Miers 2009; M. A. Ould 1997) it still provides a solid clue of many operations that are either common across industries or unique to specific industry segments such as retail banking or consumer packaged goods. None of these enterprise operations can be modeled by workflows.

In addition, the componentised business architecture and its resulting industry models addressed in Sanz et al. (2012) are also very useful to illustrate the same points. In these approaches, there is no functional decomposition at the heart of the modelling, unlike in PCF, and thus the resulting construction follows more closely some of the core principles of Enterprise Engineering (Dietz et al. 2013). This will be addressed briefly in the next section.

(6) Another important evidence that process has moved out of the industrialisation box is *Case Management* (more recently also called Adaptive *Case Management* by the authors in (Swenson et al. 2010) and *Dynamic Case Management* by analysts in Forrester). The need for Case Management has been illustrated with different enterprise operations such as claim processing in Property and Casualty Insurance, customer applications in Social Services, Health Care claim processing, Judicial Cases, and so on. Van der Aalst and others (Aalst and Berens 2001; Aalst et al. 2005) presented *Case Handling* as a new paradigm for supporting *flexible* and *knowledge intensive* business processes. In his work on case management, De Man (2009) states that 'workflow' is an adequate representation for factory-type, highly predictable behaviour admitting for little or no deviation from pre-established models. In recent literature (Khoyi 2010), the argument in support of the need for Case Management hinged around the fact that "*Case Management allows the business to be described in known terms rather than artificially fitting it into a process diagram*".

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educated customers are asked first whether their obviously nonfunctioning product is plugged to the power supply, to unplug and plug it again, try to turn it on once more, and so on.
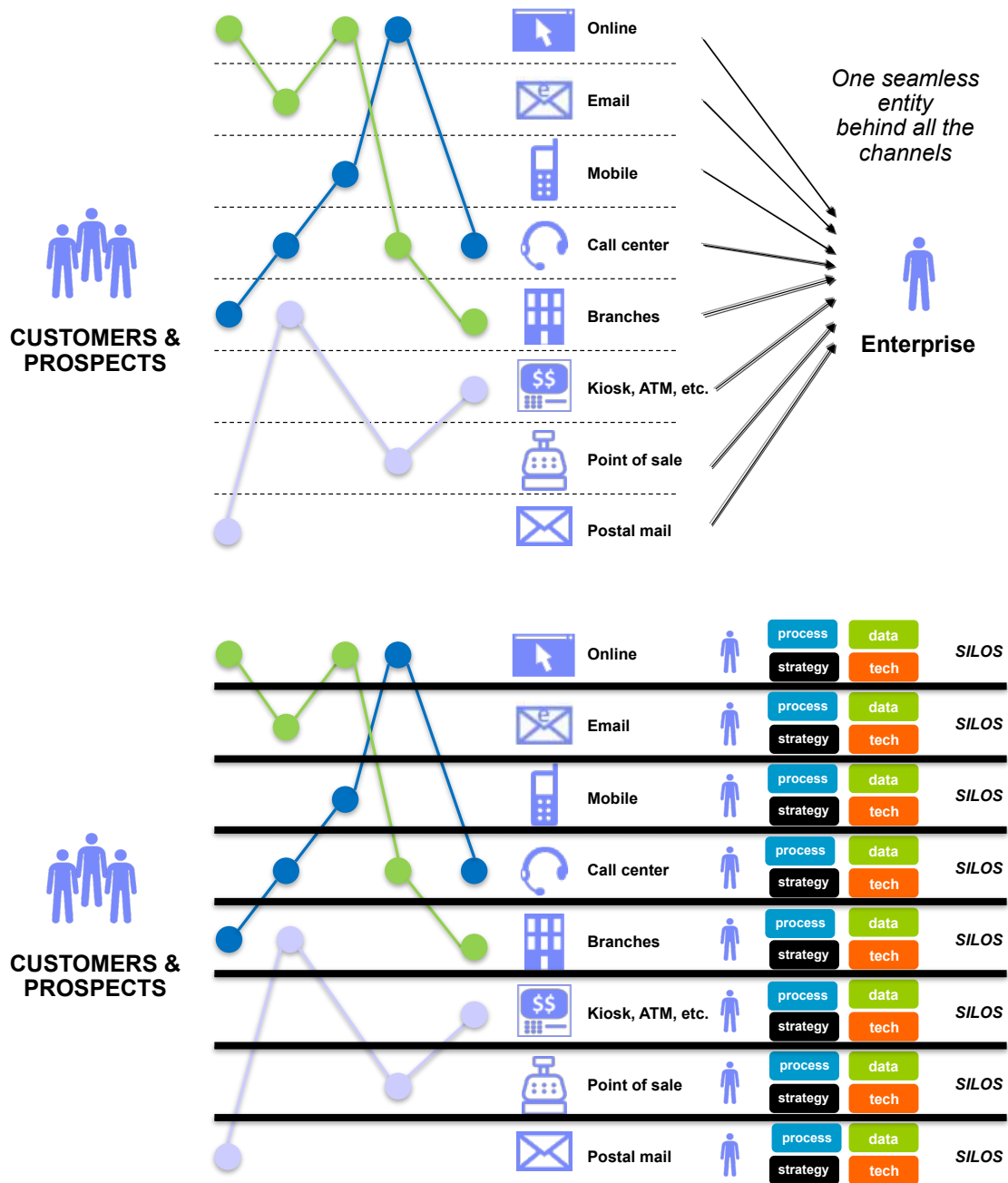
Figure 2: Customers and prospects deal with an enterprise through a number of channels by following patterns or Journeys that vary according to individuals' goals and behaviour. The picture on the upper side represents the expected experience of meeting the enterprise as a single and well-integrated entity. However, reality is very different as channels are not well-integrated, represented visually by the horizontal silos of the lower side picture. Each silo has their own processes, data, strategy (incentives) and IT. Thus, a Customer Journey is the integration of individual customer-enterprise touch-points to realise a specific customer outcome. These Journeys are essential processes deeply related to loyalty and other significant measures of customer experience, unlike traditional customer satisfaction metrics.

2 Process and the Broken Customer Experience

In the context of this paper, customer experience is the conjunction of all experiences a consumer has with an enterprise over the duration of their relationship (Harrison-Broninski 2005). Customer experience is critical for enterprises because it has been widely understood as a key factor driving customer loyalty (Propp 1968). Poor customer experience in business-toconsumer enterprises has been a top concern in organisations for longer than five years. The main reason is the profound lack of loyalty that customers exhibit in the business-toconsumer (b-to-c) industries (Capgemini 2012).[5] While this challenge has been commonplace in many industry segments, the problem is particularly acute in most b-to-c services organisations where many initiatives have been taken to address the problem, even to the point of introducing a new role at the top management level called *Customer Experience Officer* (Bliss 2006).

The advent of multiple channels of engagement for the same enterprise exposes deeper gaps in the way organisations deal with their customers. Indeed, multiple channels have generated even more disconnects with customers as these channels are generally managed by different organisational units and have isolated measures of performance. Traditional customer satisfaction measures tend to focus on individual customer interactions on a specific channel but these do not seem to correlate positively with customer loyalty (Rawson et al. 2013; Stone and Devine 2013). Figure 2 illustrates customer in-

teractions[6] taking place across different enterprise channels (upper side of the Fig.). These patterns are typical for a single customer pursuing a specific outcome. In most organisations, each channel behaves as a silo (lower side of the Fig.) thus having its own strategy, goals, processes, data and technology. This disconnect across channels impacts customer experience quite negatively. In summary, **a much more engaged consumer through multiple channels is making the already disrupted customer experience *unmanageable* for large enterprises**.

All these challenges lead organisations to revisit some of their core competences related to customer experience. In fact, a number of key capabilities have been emerging over the last decade, starting to yield best-practices for front-office operations (Hastings and Saperstein 2007). However, it is the **lack of understanding, modelling and instrumenting critical customer journeys the main reason why customer experience continues to be disrupted and has got worse with the advent of more channels**. Furthermore, aligning these *customer journeys* with back-office operations yielding end-to-end business processes is essential to enable customer experience. Business analysts characterised this new process trend directly affecting customer experience under different names and also alerted practitioners, researchers and process professionals about different shifts taking place along the entire "hype cycle" of process evolution. In particular, Forrester used the name "tamed processes" and characterised them as follows: "*Tamed processes are designed from the outside in, can be driven by big data and advanced analytics, support social and mobile technology, provide end-to-end support*

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[5]In North America, 80% of clients are "happy" with their bank service but **only 50% say they will remain with their current bank over the next 6 months**. This reflects the finding that globally, only **42% of bank customers have rate their experience as being positive**. Furthermore, satisfaction levels with branches, despite being the most expensive and most developed channel, averages 40% worldwide with highest being 60% in North America (Capgemini 2012).

[6]The set of customer-enterprise interactions followed to achieve a specific outcome for an individual costumer has been named *customer journey* (Rawson et al. 2013). This term has probably been coined by some technical and business people with the goal of implying that the concept should not be made part of the classical "process grinding" experienced though four decades of BPM, lean six-sigma and the like. Beyond communication intent, *journeys* are processes and this is a well-supported fact in Social Science work.

across systems of record and functional areas, and link on-premises and cloudbased services" (Le Clair 2012).

Engineering (i.e., designing and running) these *customer journeys* is a very different problem from those BPM has been focusing in four decades. These needs around modelling and architecting for customer experience are in sharp contrast to applying Customer Relationship Management (CRM) packaged applications used to monitor sales, manage customer center calls or design optimised workflows for efficient backoffice processes. In fact, there is a risk that software may be used precipitately for supporting enterprise capabilities related to customer experience. Indeed, some of these emerging practices are being made into software without adequate exposure of the underlying business processes. This should constitute a warning to management as **these software applications bury rich business processes into their packaged software**, thus signaling the same issues experienced in mature back-office operations. This warning is a significant call for the adequate research and practice necessary to **surface the key processes before they are fully embedded into "concrete"**, a fact that will impact agility as the frequency of change in these processes is a lot higher than in those modeled in conventional enterprise resource planning. Traditional approaches to business process instrumentation based on packaged applications in conjunction with custom BPM systems come to memory after four decades of cost-take out and efficiency improvements. In part, this rigidity has created *fragmented* customer experience as a consequence of the lack of flexibility and long time-to-value for desired changes in the information technology systems deployed across the enterprise. This is an observation coming from direct practice in the field and can also be corroborated by exploring a very extensive business literature. In short, **if front-office processes are not addressed according to the new business and societal needs, the ongoing fragmented experience will result in ad-**

ditional loss of loyalty and consequently, customer equity or profitability issues (Villanueva and Hanssens 2007).

Probably to the surprise of many data analytics advocates, if customer-centric processes are not engineered to reflect the demands from the new economy, the emphasis on *individualising customers* and "inferring their behaviour" will just make customer experience even worse. The reason is that customers will increase their expectations for personalised services while the ability for organisations to address this expectation remains far from the current state-of-the-art. This issue will become particularly challenging for some services industries because (i) such personalisation may not be viable due to the nature of the service being delivered; (ii) personalisation requires in many cases a co-created design and delivery, a pursuit that many enterprises are not yet in a position to address; (iii) regulatory limitations may prevail thus limiting the enterprise to discriminate across customers; or (iv) scalability of good quality customer service may be at odds with profitability targets. This remark is an attempt to warn "data scientist" approaches to front-office operations, as the main disconnects will only be widened by "data-only" insights.

3 Process in critical areas of the Front-Office

The term "Front-Office" is used here to denote the set of enterprise activities and resources dedicated to the support of customer experience. In this category, they fall many customer service management operations. But other Front-Office areas in organisations also go beyond the purpose of dealing directly with customers. Some examples are brand monitoring, campaign design and deployment, enterprise marketing operations, product and service innovation, customer loyalty and advocacy management and others among the top areas where organisations have been investing in the last decade or so. These enterprise capabilities and related competences support customers indirectly, although boundaries may blur

in some cases (for example, a campaign design may involve realtime intervention based on customer interactions). These capabilities are beginning to have more visible best-practices and thus, corresponding business processes are emerging. Consequently, their study is at the realm of Business Process Engineering because they encompass key work-practices. These operations involve humans and collaborative activities deeply interrelated with technology and information, and their patterns of work are also emerging, become more and more visible, being subjected to *white box modelling* rather than remaining as *black boxes*. In these new process areas, Information Technology will still be essential but in radically different ways from "the factory" of enterprises. Actually, translating those experiences from Information Systems in the Back-Office to the Front-Office is a sure recipe for disaster. This inadequate translation would also add significant longterm strategic and cost-centric consequences to the ongoing broken customer experience.

Searching for further practical evidence on the emergence of non-traditional enterprise areas needing process study, it is important to revisit in depth some theories of organisational design and related work by different business research schools (Penrose 2009). Figure 3 shows an organisation of the resource-base of a typical enterprise into four distinct types and the corresponding bundling of such resources into disjoint business components. Each column on the right hand side of the Fig. represents one typical competence whose organisation is described by the generic concepts of the column on the left, as presented in Sanz et al. (2012). Although a different language was used, the foundations of the structure of a generic competence should be honored to Brumagin in Brumagim (1994), among other more recent business researchers.[7]

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[7]This is probably the only known actionable model derived from the general and powerful concepts running under the denomination of Resource-Based View (RBV) in the theory of the firm. Business process researchers are strongly encouraged to delve into RBV, search for cross-pollination with related Social Sciences work, and revisit

Notice that the hierarchy of resources represented in Fig. 3 does not mean the same as the classical management concept of "control". Instead, it only represents an arrangement in which different skills, information, assets (intangible and capital) and derivative entangled capabilities are bundled together to produce one or more relevant outcomes in the enterprise. Likewise, these components are not necessarily aligned with traditional Lines-of-Business and do not intend to map departmental capabilities or other conventional "reporting structures" in enterprises. Revisiting Penrose (2009), the components highlighted on the right may be thought as the formalised grouping of resources whose entanglement produces those core services (internal or external) that the organisation needs to serve all stakeholders. Some enterprises may be endowed with some of these resources in unique ways, being also more idiosyncratic for some industries than others.

Concrete models recently built for many industry segments by following the modularisation principles reveal that there are hundreds of business components that the business process tradition has failed to address. In fact, most processes available from the research literature fall in the category of operations involved in the last row of business components, i.e., *production and maintenance processes*. As the level of involved resources moves into *oversight and management*, several interesting examples of *cases* may be found and used to illustrate the type of operations at play. Going further into *learning and innovation*, traditional contributions fade quickly or disappear entirely. Interestingly, the top row of Fig. 3 includes the 'strategy processe' that Van der Aalst and collaborators explicitly excluded from their foundational work in the early 2000's. A diversity of processes like those needed for controlling the quality of a cartoon in an entertainment industry enterprise, managing the pipeline of compounds in a pharmaceutical

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business research topics such as those addressed in Organisational Behaviour schools.
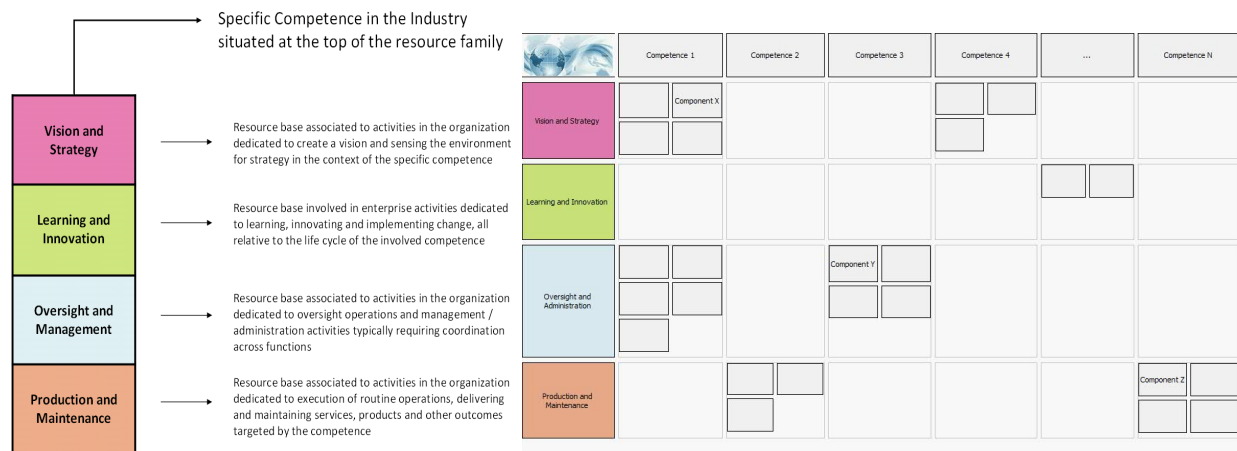
Figure 3: The four types of resources defined according to the different forms of behaviour that are observed in a generic enterprise (left). Componentised organisation of such resources based on different competences (right). Each of these components deals with a number of core subjects (Nandi and Sanz 2013) whose evolution is key for the definition of corresponding competences (columns in the picture)

company, and disseminating the learning harvested from a specific family of consulting practices throughout a services enterprise should not be included under the term 'strategy'. However, these *oversight and management* processes have not been addressed by the BPM tradition.

There may be still an argument that processes in classical BPM work aim at modelling operations *across the components and not inside them*, i.e., end-to-end processes also called '*value streams*' in some business literature. However, this argument does not necessarily follow from inspecting the work reported in more than one thousand papers in the last twelve years. The BPM tradition has adequately responded to the need of minimising transaction costs across the enterprise and builds upon existing governance mechanisms defined as true *systems of control* aligned with functions (Le Clair 2012). In that sense the traditional approach has followed closely the enterprise disconnection and rigidity leading to the present state-of-the-art in customer experience. Moving the foundational basis to address the next generation of business process (called "*hybrid connected processes*" in Le Clair (2012)), crossfunctional and complex processes (i) cannot be made or realised into workflow structures

and (ii) new languages are needed to close the remarkable communication gap left in the cross-enterprise process space. It would be impossible to address these statements in full detail here but it should suffice to say that *loss of visibility* in cross-enterprise processes is a proven pain-point (Nandi and Sanz 2013) still yielding well-identified *performance* and *communication problems* in many firms. In other words, the "hundred of pages" alluded by Dietz (2011) are real and the insight that these many pages have unraveled is minimal.

From a research perspective and practical point of view, the reader is referred to the recent work in Nandi and Sanz (2013) for evidence that the main 'value streams' across an enterprise are in fact *progressions of core subjects* and not *life-cycle of objects*, at least when the latter is understood in the tradition of *statemachines*, i.e., artifacts evolving through a number of micro-states that separate the initiation and completion of "tasks". This fact goes back to the fundamental way metaphysics of processes has been approached in Social Sciences (Rescher 1996) and the conceptual duality between process and *subjects*[8] in the organisation of the world of a gen-

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[8]The word "subject" here means "theme" or "topic". This

eric enterprise. Indeed, *subjects* are higher-level abstractions than conventional *objects* and their evolution is thus subjected to lots of asynchronous activity taking place across the enterprise. The delivery of outcomes produced by these asynchronous activities signals the completion of necessary results as agreed in pre-determined cross-functional *commitments*. These *commitments* are, in fact, a form of organisational contracts and may be regarded as quite granular macro-states in the evolution of an individual *subject*. These 'states' are called *milestones* in Nandi and Sanz (2013).

The need for aligning the research agenda in process to the main challenges faced by industry was also called out in the closing recommendations from the BPM study in Indulska et al. (2009): "... *despite being an actively researched field, anecdotal evidence and experiences suggest that the focus of the research community is not always aligned with the needs of industry*". A couple of years have elapsed since related papers were published but the situation has not changed much. Reijers et al. (2010) also addressed the importance of rooting BPM activities in industrial practice and correctly questioned the understanding of the actual adoption of BPM by organisations: "... *it may come as a surprise that contemporary insights are missing into which categories of organizations are adopting BPM and which type of BPM projects they are carrying out*". Actually, Aalst (2012) did some justice in his recent review of research in the last decade of BPM Conferences and highlighted that this work mostly addressed automation concerns. In particular, Van der Aalst revisited BPM systems as an opportunity to further position BPM tools as valuable instruments to build better software applications.

While this traditional BPM research work and practices should definitely continue, new market trends and needs from new enterprise capabilities in the Front-Office strongly suggest that

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differs from the interpretation of subject as an actor carrying out an activity, and thus, it should not be confused with related semantics in S-BPM.

business process focus has to shift in order to contribute to other urgent goals in organisations. Business process is called to play as a key instrument for achieving the *customer experience* needed in *front-office* operations and deep end-to-end integration of the latter with the *back-office* in enterprises. The main motivation for the new work needed does not hinge around cost reduction, industrialising routine operations or building better software with BPM systems.

4   Back to Process Foundations

The evolution of business process has not happened without significant divergence and to some extent, also confusion. The state-of-the-art is plagued by language chasms, cultural silos and idiosyncratic viewpoints. Some of these challenges were documented in De Man (2009); Indulska et al. (2009); Recker et al. (2009); Reijers et al. (2010) and others. Reijers et al. (2010), state the challenge in clear terms: "*Considerable confusion exists about what Business Process Management entails ...*". Indeed, the definition of business process is still troubled by ambiguity and adding the term "management" has done little to clarify the confusion. A plea for this clarity has been articulated by Olbrich (2011): "*It seems a pity that a lot of current research fails to provide a basic definition of what underlying understanding of 'process' and 'BPM' it bases its work on*". In further exchanges in the same S-BPM conference, other authors such as Fleischmann (2011); Singer and Zinser (2011) agreed that the problem goes further into a lack of clarity on the very definition of BPM. A review of the literature shows that there is not a single and agreed definition of these terms. While "... *a scientific foundation is missing*" was clearly stated by Van der Aalst back in 2003, the review of BPM Conferences published by the author a decade later confirms that the fundamental shortfalls have not been overcome yet (Aalst 2012). The underlying reason is deeply related to the nature of business process being a *socio-technical system* and thus, its

complexity cannot be approached by a narrow focus on technology dimensions. In Fleischmann's own words: "*. . . sociological systems like organizations are combined with technical systems like information and communication technology. For a holistic view of business process management we have to consider all aspects*" (Fleischmann 2011). Weske (2012) also highlights the deep nature of process: "*a business process consists of a set of activities that are performed in coordination in an organizational environment. These activities jointly realize a business goal.*" While using different language, other authors also defined business processes (Davenport 1993; Debevoise 2007; Dumas et al. 2013; Indulska et al. 2009; Krogstie et al. 2006; Ould 1995a; Smith and Fingar 2007 and the list goes on).

The Object Management Group recognised the foundational problem with the definition of process. Siegel (2008), the leader of the BPM group stated: "*there is no agreed-upon industry definition of Business Process. Instead, there are multiple definitions, each looking at the field from its own unique point of view, concentrating on its own set of concerns*". Certainly, it is not a matter of one definition being right and the others being wrong. Rather, the issue is about the varying points of view used. As a consequence, the main efforts in process modelling standardisation have not yet yielded the expected outcomes, as discussed in Recker et al. (2009), more broadly exposed in Indulska et al. (2009) and highlighted in Aalst (2012). Unquestionably, most people do have a similar and informal notion of "business process". But this intuitive agreement does not mean a convergence across viewpoints. In fact, the variations in the definition of process may suggest that the term is a *boundary object* across disciplines, individuals from different units of an organisation or communities of practice. Other researchers in Social Sciences and Philosophy have also focused extensively on the concept of process and its definition. Ven (1992) addressed the topic in the context of one of the most complex types of processes in organisations, i.e., the strategy process. The depth of Van de Ven's classification reveals the foundations underlying many business process definitions. In spite of having been published two decades ago, this work has gone unnoticed in most of the BPM literature (Aalst 2012; Aguilar-Savén 2004; Klein and Petti 2006; Ko et al. 2009; Lu and Sadiq 2007; Ould 1995b; Propp 1968; Toussaint et al. 1998; Trkman 2010 and many others).

Another language chasm across different schools of thought or communities of practice is the unclear relationship between the concept of business process and that of *organisational routine*. Rich literature is available on the study of routines (Becker 2004), the significance of routines as a unit of analysis for organisations (Levin 2002; Pentland and Feldman 2008; Pentland et al. 2012) the collectivist meaning of routines and the need for establishing solid micro-foundations (Felin and Foss 2004) among others. It is very likely that business process and routine address identical concerns in organisation theory; however, in spite of the prolific technical production in the two subjects during decades, their formal relationship and the reasons for keeping two different terms remain unclear.

More recently, there has been a fundamental piece of work in process that builds upon a reconciled view of process and information available since the early days of the Information Engineering schools in Europe. This approach to business process goes under the brand of *entity-centric operations modelling* (Sanz 2011) and offers a holistic approach that reunites different types of processes under the same conceptual understanding. This entity-centric concept has been used intensively by (Ould 1995a,b) and although the notion of life-cycle is from the early 1980's, several important contributions has been made in different industries and software to merit a detailed inspection in Business Process Engineering (Bhattacharya et al. 2009; Cohn and Hull 2009; Nandi 2010; Nigam and Caswell 2003; Robinson 1979; Rosenquist 1982).

Quite interestingly, another related approach was recently presented to model cross-functional end-to-end processes in enterprises based on the notion of *subjects* and *nexus* of *commitments* (Nandi and Sanz 2013). The foundation for all this work appears as an important step toward the design and construction of different process types, including the so-called *value streams*, by using a common approach in which information does not take back seat as a mere "after-thought" in the modelling of behaviour or becomes confused with "state model", being the latter a common misunderstanding incurred by most computer scientists as Van der Aalst remarkably noted. The point of reunion of these seemingly related modelling techniques does not reside in "artifacts" or "object life-cycle" but instead, it goes back to the Social Sciences in the sense that the unifying concept is the very epistemology of process, i.e., "things in the making" (Tsoukas 2001; Tsoukas and Chia 2002). Consequently, process design is about describing *the evolution of a core subject.* While the roots of this approach come from several decades of work and different schools of thought, not all process researchers and practitioners seem familiar with these concepts and related literature sources.

5   Research topics in Business Process Engineering

It would be difficult to propose here a complete agenda of research and practice in Business Process Engineering. Like in any other emerging field of work, only the pass of the time, community activities and market consolidation will determine its boundaries and shape its ultimate priorities. However, based on current work and ongoing industry needs, it would be safe to highlight some important areas with the purpose of stimulating further research.

This is a first pass through such a list. Topics are classified according to four basic categories:

Customer-Enterprise Behaviour: Foundations and Models

(A) Establish a foundation for understanding and modelling the *journeys* that customers follow in their multiple touchpoints when interacting with enterprises across different channels. These journeys are probably the most looselycoupled type of processes, i.e., they are highly unstructured but they are not "random walks" at all as customers seek for specific outcomes. This type of interactions is also found in other collaborative work in enterprises (Harrison-Broninski 2005). In addition, as involved interactions combine and alternate human-to-human and human-todigital contacts, these journeys are rich in information and behaviour. Then, their adequate understanding is imperative for the next generation of customer experience. Some work has been done on this topic but there are no foundations yet with a theory that explicates the journeys and how behaviour of the actors should be guided from footprints of customer contacts and previous experiences. This is one of the most fundamental research problems that different industries need to benefit from as its value is directly related to customer loyalty.

(B) Discover customer-enterprise co-creation mechanisms and have them reach a massive scale through innovative processes. This will support the social transformation necessary for the information coming from social data to become a **trustable source of actual behaviour and intent of individuals**. While social media means a flood of useful data, inferring human intention and behaviour from these sources remains illusory. *Co-creation processes* deploying collaborative and mutually beneficial practices appear essential for the next generation of customer experience. Explicit provision of knowledge on an individual could be then done in exchange for personalised services or some other form of tangible value-propositions. This will lead individuals to provide trustworthy evidence of their behaviour and intent. Designing and implementing the necessary processes to reach the scale

needed requires deep socio-technical innovation. These processes will also help encourage full transparency from consumers and enforce accountability from companies. The latter will help replace today's legal disclaimers in which consumers are asked to resign their privacy rights under terms-and-conditions that probably few consumers read and even a fewer number of them understand.

(C) Create a "sociology of the customer" that helps understand the effect of using mass processes even with individualised clients in the pursuit of 'profitability'. If economic analysis renders it viable, data footprints left by consumers will not be the only hint to infer customer behaviour (which is an erroneous approach to understand people's needs and true expectations anyway). Furthermore, the integration of process and big data will allow for full operationalisation of "insight", thus making the latter move from "interesting discovery" to a Social Science-supported theory to enhance services and provide enterprises with higher customer equity.

Front-Office Business Architecture

(D) Propose complete Front-Office operational models that represent the actual work enterprises do with and for their own customers. This should include *process and performance framework*s for *all* those key competences and capabilities in the enterprise that belong to the Front- Office operations. In particular, the creation of solid Process Reference Architectures for emerging operational areas in marketing, brand management, campaign management, etc. would be critical for accelerating industry value of new research. As suggested earlier in this paper, surfacing and documenting these new workpractices is essential. Software packages are already in the market and these applications bury important processes whose frequent change is imperative for flexibility of Front-Office operations.

(E) Reconcile the ever-deepening silos of Information and Process. As suggested by the different levels shown in Fig. 4, the information and process domains have traditionally evolved in almost complete isolation from each other. As damaging as this disconnection may result for the well-being of any organisation, the problem has stayed unresolved throughout several decades. In fact, the gaps have widened and got deeper as the new "business analytics" trend has been getting momentum in enterprises and gathering the attention of the Chief Marketing Officer. The introduction of "big data" and other marketing concepts in Information Management technology has continued to widen the chasm. Hopefully, by building on a new foundation where the Information Process in organisations and society is repurposed as a single phenomenon through Business Informatics, new bridges will be built across the two silos. This reunion is dubbed "*Deep Process meets Business Analytics*" on Fig. 4. The need for this integration will reposition "process analytics" as the integration of on-line (real-time) analytics and customer journeys.

(F) Provide data-only analytics and related statistical modelling with a better foundation through behaviour-based causation. This should help foster a blended approach through "white box" Enterprise Engineering modelling for today's decision-making techniques based on "black-box" statistics. Among other areas of critical enterprise value, this topic should also help define an enterprise business performance framework that integrates behaviour and data in organisations. This goal corresponds to achieving the important integration shown in the top level of Fig. 4.

(G) Develop a theory of Process Modularisation that is consistent and evolvable with change. This work has been initiated by different colleagues in (Nuffel 2011). As the "unit of change" in Process gets progressively more clear, the topic of Process Evolvability will also become connected to modularisation, thus addressing
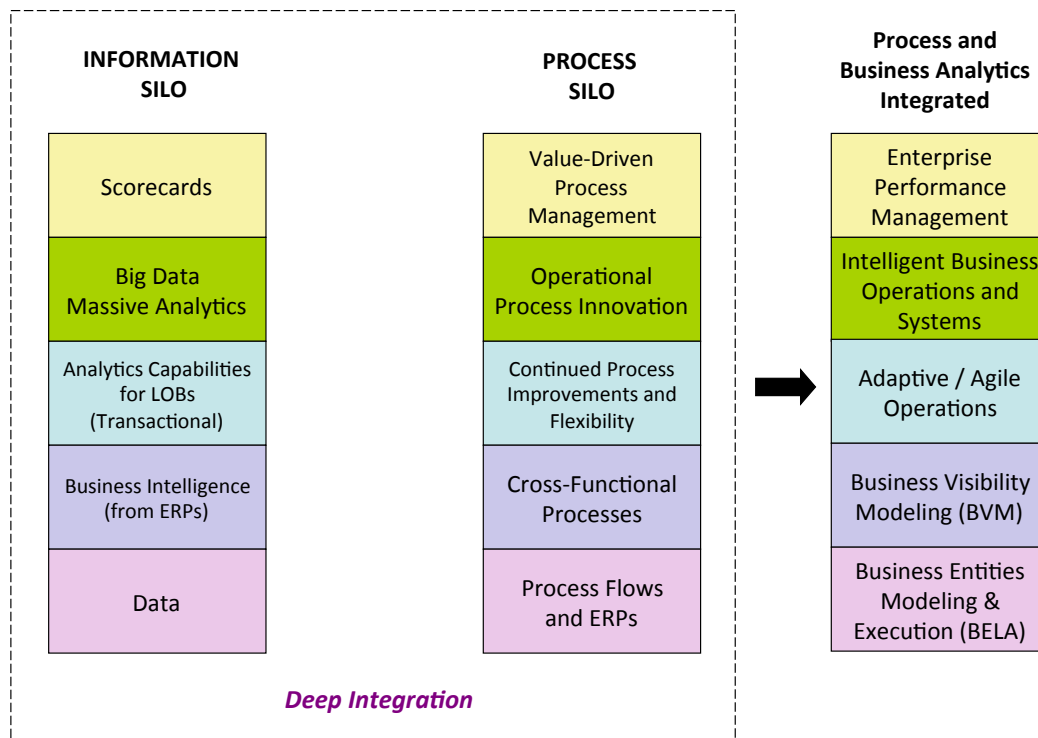
Figure 4: Silos in information and process management have deepened with the evolution of each domain. This gap is more notorious after the advent of business analytics, scorecards, performance management and value-driven process BPM

the need for managing combinatorial effects (as already addressed by the general principles of Normalised Systems Theory in (Mannaert and Verelst 2009) for the case of software systems).

(H) Clarify the distinction, if any, between the Social Science concept of *organisational routine* (Pentland et al. 2012) and the broader meaning of process coming from Business Process Engineering. This will help reconcile work across the different schools of research in Social and Computer Sciences. While practitioners seldom use the word "routine" (and when they do, they imply repetitive or boring tasks which is not the meaning in Social Sciences), it is important to benefit from cross-insemination between Enterprise Engineering and Social Science research for better understanding of organisational design through deep behaviour research.

(I) Benefit from Enterprise Engineering principles to reposition the role of humans in the value-creation of Front-Office business areas. This topic has several deep social connotations and should include the provisioning of economic evidence of the scalability (or lack thereof) of human-centric methods for understanding individual behaviour of customers.

Industry-Oriented Content

(J) Create industry-specific multi-channel customer journeys for key services industries such as banking, insurance, retail and telecommunications. Link to and support these customer journeys with knowledge-based representations that bridge process and knowledge management. This is a significant area of work that will pave new integration of Process with Knowledge Management by creating a *customer-centric knowledge-based organisation of*

the enterprise. The meaning of the latter statement is about making all pertinent information from an enterprise to be organised and be made available to customers in new, intelligent ways in which "process footprints" serve as a historical base to reorganise and find information personalised to individual customers (this comment comes from a private communication with P. Nandi).

Tooling

(K) Propose new tools that further the current state-of-the-art of Information Technology for process design and construction in the concert of a Business Process Engineering approach (in this connection, the generation of code is a secondary concern but flexible and open endto-end integrated capabilities would be a breakthrough). These process tools will be the carrier of data analytics in real-time while supporting the delivery of personalised services to individual customers.

6   Conclusions

Business Process has left the productivity corner where it has been confined by "scientific management". With the advent of customer-enterprise interactions of all forms and exercised through multiple channels, the need for a significantly improved customer experience is an imperative in transforming front-office operations. Conventional approaches to process have proven to have a devastating effect on loyalty. Renewed research and professional efforts to approach process as part of complex social systems are a must to cope Fig. 4. Silos in information and process management have deepened with the evolution of each domain. This gap is more notorious after the advent of business analytics, scorecards, performance management and value-driven process BPM with the challenges faced in those competences of enterprises dealing with customers, particularly in the business-toconsumer industries. Business Process Engineering is a new domain of work that attempts to make the past IT-centric view of process into a multidisciplinary area of both institution and practice knowledge.

7   Acknowledgements

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