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Full Paper

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Abstract

A common view of information systems (IS) researchers is that business intelligence (BI) systems are essentially a type of decision support systems (DSS). This approach to knowledge implies that DSS theory can be transferred to BI systems in order to explain and predict their action. Further, some researchers feel that BI systems can also be adequately researched using general IS theory. This paper is the first from a project that is examining if BI systems have significant differences to operational IS and DSS. This first exploration is informed by a focus group of senior BI professionals. The study illuminates some differences between BI and other types of business IS and indicates that context could be significant for BI theorizing and that care is needed in transferring operational IS and DSS theory to BI systems research. In practice, these differences could be a source of project failure.

Keywords: Business intelligence, analytics, decision support systems, focus group, IS theory

1 INTRODUCTION

Business intelligence (BI) systems are data-intensive large-scale IT systems that support decision-making in organizations. BI systems are rarely analytics-only or reporting-only; they are a complex mix of decision support processes. Academically, BI is often thought to be part of the decision support systems (DSS) field. Surveys by industry analysts, vendors, and professional associations consistently find that BI development and deployment is one of the highest priorities for CIOs and will remain so for many years (for example, Gartner 2018). Kappelman et al. (2019) in the *SIM IT Issues and Trends Study* reported that BI is the largest organizational IT investment and has been the largest spend since 2009. There has been a slow uptake of research into BI systems development and use in organizations (Arnott and Pervan 2014).

Context is arguably essential for IS theorizing (Davison and Martinsons 2016). BI research from an IS perspective could be important as industry research reports failure rates as high as 80% for BI projects (Goodwin 2011) and low organizational usage rates when the systems are implemented (Gauzelin and Bentz 2017). If there are few important differences between general IS, DSS, and BI then existing IS and DSS theory can be an effective foundation for BI research. However, if significant differences exist then BI research needs a context specific foundation.

This paper is the first from a project that is exploring theorizing for BI and is structured as follows: First, the background section addresses definitions of both general business IS and systems that support decision making. This is followed by a description of the research method that was used for the empirical aspect of this paper – a focus group. The findings from the focus group are then presented and discussed. The analysis shows that not only are there important differences between these types of IS, these differences are poorly understood in organizations.

2 BACKGROUND – SYSTEMS AND DEFINITIONS

This section provides the background for the empirical research by clarifying the definitions of business IS, DSS, and BI.

2.1 Information Systems

In academe the term “information systems” has two conceptions; one is the title of an academic discipline and the other is an IT-based artifact in organizations. This paper is concerned with IT artifacts.

Boell and Cecez-Kecmanovic (2015) analyzed 34 definitions of IS as artifacts and found four approaches to IS: the *technology view* which focuses on the IT foundations of IS; the *social view* that focuses on the human users and the organizational context of IS; the *socio-technical view* that involves both the social and technology views; and finally, the *process view* that focusses on the activities around developing and using IS. They argue that the socio-technical view is the most promising in that IS research is inadequate if it ignores the social aspects of IS development and use, and IS research also has problems if it ignores the information technologies that constitute the foundations of the IT artifact (Robey et al. 2013). A fifth view can be added to the Boell and Cecez-Kecmanovic classification: the *ontological view* typified by Wand and Weber (1990) that views an IS as a special independent object. Table 1 shows a range of definitions of IS as artifacts ordered by publication date. This paper adopts a socio-technical view of an information system in a business context and uses the following definition:

> *A business information system is a socio-technical system that uses information technologies to support the operations and management of organizations.*

Source	IS Definition	View
Davis (1974, p. 5)	An integrated, man/machine system for providing information to support the operations, management, and decision-making functions in an organization. The system utilizes computer hardware and software, manual procedures, management and decision models, and a data base.	Socio-Technical
Buckingham et al. (1987, p. 18)	An information system is a system which assembles, stores, processes and delivers information relevant to an organization (or to society) … An information system is a human activity (social) system which may or may not involve the use of computer systems.	Social
Wand and Weber (1990, p. 1282)	… View information systems as objects (artifacts) to be studied in their own right, independently of the characteristics of their users, the organizations in which they are employed, or the technologies used to implement them.	Ontology
Avison and Fitzgerald (2006, p. 3)	An information system in an organization provides processes and information useful to its members and clients. This information might concern its customers, suppliers, products, equipment, procedures, operations and so on.	Socio-Technical

Source	IS Definition	View
Jessup and Valacich (2008, p. 567)	… computer-based systems, which are combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful information.	Process
Watson (2008, p. 9)	An information system is an integrated and cooperating set of software directed information technologies supporting individual, group, organizational, or societal goals.	Tech-nology
Alter (2008, p. 451)	An IS is a work system whose processes and activities are devoted to processing information, that is, capturing, transmitting, storing, retrieving, manipulating, and displaying information.	Process

Table 1. Definitions of an Information System

2.2 Decision Support Systems

In a similar fashion to IS, defining and using the term DSS can be confusing as it is both the name of an academic field[1] and the term for a class of information systems. Table 2 shows eight definitions of DSS as IT artifacts, ordered by publication date. The definitions were analyzed using In Vivo coding (Saldana 2013, pp. 91-6). All definitions naturally stress supporting, helping, assisting, or aiding decision making and half of the definitions view managers as the target users of DSS. In the 1970s when DSS were first developed, an organization would have relatively few personnel with the title manager; managers were the primary decision makers in an organization and were senior appointments. Over time the nature of the term "manager" has changed and devalued. From a DSS definition perspective it is now preferable to use decision maker rather than manager as the main class of DSS user. The next dominant aspect of the DSS definitions (4/8 definitions) is the use of Simon's structuredness concept (Simon 1997/1945), especially the use of semi-structured decisions as a focus for DSS. Simon's model was the dominant theory of decision making at the time of DSS's emergence (Gorry and Scott Morton 1971). This theory has since been superseded by behavioral economics and in particular by the dual process theory of decision cognition (Kahneman 2011). As a result, it is preferable to typify the target decisions of DSS as difficult, non-routine, and complex, rather than semi-structured. DSS supported decisions can also be novel and transitory, even ephemeral. Based on the analysis of Table 2, the definition of DSS as IT artifacts that will be used in this paper is:

> *Decision support systems are small-scale information systems that assist decision makers in difficult, complex, and non-routine decision tasks.*

Source	DSS Definition
Keen and Scott Morton (1978, p. 1)	The use of computers to assist managers in their decision processes in semi-structured tasks.
Sprague (1980, p. 1)	Interactive computer-based systems which help decision makers utilize data and models to solve semi-structured problems.
Sprague and Carlson (1982, p. 9)	DSS comprise a class of information system that draws on transaction processing systems and interacts with the other parts of the overall information system to support the decision-making activities of managers and other knowledge workers in organizations.
Bennett (1983, p. 1)	A DSS is a coherent system of computer-based technology used by managers as an aid to their decision making in semi-structured tasks.
Silver (1991, p. 105)	The outputs of a decision support system (DSS), such as data displays, statistical analyses, modelling results, and graphs, are intended to support the human judgment involved in making decisions.
Marakas (2003, p. 4)	A DSS is a system under the control of one or more decision makers that assists in the activity of decision making by providing an organized set of tools intended to impose structure on portions of the decision-making situation and to improve the ultimate effectiveness of the decision outcome.
Hosack et al. (2012, p. 316)	Decision support systems are developed to facilitate better decision making for difficult and complex structured, semi-structured, and unstructured decisions.
Arnott and Pervan (2014, p. 275)	Personal decision support systems are usually small-scale systems that are developed for one manager, or a small number of independent managers, to support a decision task.

Table 2. DSS as Information Systems

[1] We use the term field to indicate a subdivision of an academic discipline.

2.3 Business Intelligence Systems

Unlike DSS, with BI there is no definitional confusion between titles and terms for an academic field and an IT artifact. BI research is generally regarded as part of the DSS academic field. However, defining the IT artifacts that are BI systems can still be problematic. Table 3 shows 14 definitions of BI, ordered by publication date. As with the DSS definitions, In Vivo coding was used to analyze the definitions in Table 3. The most dominant construct in the definitions is the notion of a set of processes and technologies supporting the decision maker (14/14 definitions). The next most important aspect of the definitions is that BI involves both data and analytics (12/14). Also important in defining BI is decision making (10/14), decision support (6/14), and the scale of the systems (8/14). Based on this analysis, the definition of BI systems used in this paper is:

BI systems are large-scale systems that combine information technologies, data reporting, and analytic processes in order to support decision making in an organization.

Source	BI Definition
Negash (2004, p. 177)	Business intelligence systems combine operational data with analytical tools to present complex and competitive information to planners and decision makers.
Davenport (2006, p. 8)	A BI system encompasses a wide array of process and software used to collect, analyze, and disseminate data, all in the interests of better decision making.
Watson and Wixom (2007, p. 96)	BI consists of business users and applications accessing data from the data warehouse to perform enterprise reporting, OLAP, querying, and predictive analytics.
Baars and Kemper (2008, p. 132)	Business intelligence is now commonly understood to encompass all components of an integrated management support infrastructure.
Foley and Guillemette (2010, p. 4 & p. 1)	BI is a combination of processes, policies, culture, and technologies for gathering, manipulating, storing, and analyzing data collected from internal and external sources, in order to communicate information, create knowledge, and inform decision making. The main objective of BI is to support managers in their decision-making process.
Wixom and Watson (2010, p. 14)	Business intelligence is a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users make better decisions.
Popovic et al. (2012, p. 729)	Business intelligence systems have emerged as a technological solution offering data integration and analytical capabilities to provide stakeholders at various organizational levels with valuable information for their decision making.
Isik et al. (2013, p. 13)	BI is a system comprised of both technical and organizational elements that presents its users with historical information for analysis to enable effective decision making and management support, with the overall purpose of increasing organizational performance.
Arnott and Pervan (2014, p. 275)	BI are large-scale systems that use data and analytics to support decision making at all levels of an organization.
Chen et al. (2014, p. 1166)	BI involves techniques, technologies, systems, practices, methodologies, and applications that analyze critical business data to help an enterprise better understand its business and market and make timely decisions.
Arnott et al. (2017, p. 58)	BI is the umbrella term for large-scale decision support systems in organizations.
Trieu (2017, p. 111)	BI is typically used as an 'umbrella' term to describe a process, or concepts and methods, that improve decision making by using fact-based support systems.
Fink et al. (2017, p. 39)	BI is an overarching term for decision support systems that are based on the integration and analysis of organizational data resources toward improving business decision making.
Gaardboe and Svarre (2017, p. 471)	BI is an umbrella term for the technologies, applications and processes associated with collecting, storing, using, disclosing and analyzing data to facilitate sound decision making.

Table 3. Definitions of Business Intelligence Systems

System scale is an important distinguishing aspect of the DSS and BI systems definitions. Scale is not determined by technology or data volumes but by the number of users and the number of decisions that are supported. For a DSS there is often only one decision maker and one decision that is supported. For a BI system the potential user population can be very large, often in the hundreds, even thousands. As a result, large-scale BI systems can typically support a large number of decisions. Scale has important implications for systems development and management. Smaller DSS can be easily changed or discarded, whereas BI systems can be difficult to change in a significant way and their discard can have serious consequences for sponsors and developers. DSS development can be funded through a manager's budget, while BI systems are usually a major organizational spend and need to progress through the organization's approval process for large-scale investments. BI systems are normally subject to the project management and IT governance processes that typify large-scale operational IS. On the other hand, DSS have little in the way of formal IT management and governance.

2.4 Differences between IS, DSS and BI

From the inception of DSS research, researchers have argued that DSS are fundamentally different to other business IS. The DSS focus on smaller managerial decision tasks, that are volatile and hard to understand was at the basis of the arguments for difference. In the seminal article of the DSS field, Gorry and Scott Morton (1971) argued that in contrast to DSS "Management Information Systems … (is) an area that has almost nothing to do with real managers or information but has been largely routine data processing" (p. 61). Keen and Scott Morton (1978), the first important book in the DSS field, devoted the whole of their Chapter 2 to a treatise on the differences between MIS, IS, and DSS. Sprague and Carlson (1982, p. 300) identified five characteristics of DSS and argued that MIS and EDP[2] systems do not meet any of these characteristics. Alter (1980, ch. 1), in a more nuanced approach, identified an overlap between EDP and DSS. He defined this overlap as the provision of standard reports to decision makers; this is an important part of contemporary BI systems. More recently Clark, Jones, and Armstrong (2007) argued that business IS can be broadly divided into systems that support managerial decision making and systems that support the operations of organizations. Through their meta-analysis they suggested that DSS-specific theory is needed to explain and predict the outcomes of DSS development and use and that general IS theory is not transferrable to DSS. Further, they argued that theory developed in one form of DSS should apply to others, both to current and future DSS approaches (Clark et al. 2007, p. 603).

There is little recent refereed research on the differences between IS, DSS and BI. Popovic et al. (2012) is an exception. They identified nine sources of difference between operational IS and BI systems, differences that were not based on empirical research. Their sources have echoes with the IS/DSS differences that were identified in the 1970s and 80s. The most common distinction in general BI articles is that operational IS are appropriate for structured tasks and BI for semi-structured tasks. This outdated task characterization is taken as axiomatic. It is clear that the issue of differences between, operational IS, DSS, and BI is currently a gap in the research literature.

3 RESEARCH METHOD AND DESIGN

This section describes the method used to explore the differences, if any, between BI systems and other business IS. It was felt that practitioners may be able to shed light on contemporary types of IS with an emphasis on BI and its relationship to other types of IS. Two research methods were considered to gather these opinions – survey and focus group. Both methods collect opinion data at a particular point in time. A survey can collect data from a large number of participants and is relatively easy to administer and analyze. However, surveys can be problematic for topics that are not clearly defined and where there is little consensus on meanings and issues before the study (Morgan and Krueger 1993, p. 16). Further, when dealing with highly conceptual items, a survey instrument may be discarded or passed to a junior manager. On the other hand, focus groups involve a small number of participants which constrains their generalizability, and they are relatively difficult to organize and analyze (Onwuegbuzie et al. 2009). Importantly, focus groups are particularly useful for exploratory studies (Bloor et al. 2001, ch. 1; Stewart et al. 2007, ch. 3). A small sample can gather genuine expert opinion and a focus group can attract very senior participants. The most important feature of a focus group is the interaction between participants. Participant's ideas can be triggered by other participant's input and the level of agreement or disagreement on specific issues can provide a nuanced analysis of the research problem (Krueger and Casey 2015, ch. 1). Focus groups have been widely used in IS research (for example, Jarvenpaa and Lang 2005; Rosemann and Vessey 2008; Torkzadeh et al. 2006; Tremblay et al. 2010).

The focus group in this research was conducted in a special purpose laboratory equipped with sound proofing, video and audio recording, and an observation room with a one-way glass wall to the laboratory meeting room. The focus group comprised two one-hour sessions. The focus group moderator has formal training and significant experience in focus group facilitation. The other authors observed the sessions through a one-way mirror. The sessions were audio and video recorded and were professionally transcribed. The video recording was used to note important non-verbal communication. The transcribed data were entered into NVivo software for analysis. Notes taken by the observers and participants were added to the research database. A condition of ethics approval for the research was

[2] Electronic data processing (EDP) was the term applied to operational transaction processing systems in the 1960s and 70s.

that the privacy of the participants be protected and as a result they are not personally identifiable in the analysis.

For this study the views of BI software vendors, consultants, and user organizations who were highly experienced with BI systems were canvased. Further, the viewpoints of both private and public organizations were sought. In addition to identifying different system types, the focus group discussed the important and defining attributes of IS types. Because the focus of this study is BI systems, the selection criteria for participants was that they had at least 10 years' experience in developing BI systems in addition to other business IS. They also needed to hold a senior position in their organization, a position that affects how systems are developed, deployed, managed, or marketed. The group size was appropriate for the study; as related by Krueger and Casey (2015, p.82) "… as people have more specific expertise on the topic … then the group size should be restricted to five or six people." Six participants were selected to represent a cross section of practice: two were from vendors, two from consultancies, and two were senior developers (one from a large government organization, one from a large private corporation). In terms of highest qualifications, one participant had a PhD in IS, two had master degrees, and three, undergraduate qualifications. The total BI experience of the group was 92 years (average 15.3 years per participant) and participants had been part of the development of 268 BI systems (average 44.7 systems per participant). This means that the group was extremely experienced and knowledgeable. The composition of the focus group also shows the power of the expert focus group as a research approach as hundreds of systems' experience was intensively directed at the research discussion.

4 FOCUS GROUP FINDINGS AND DISCUSSION

Participants were unanimous in stating that the lack of a perceived difference between BI and other business IS not only exists in practice but is highly problematic for BI development and implementation. They also unanimously believe that these differences are poorly understood by central IT functions as well as by business managers and executives in their organizations. Some participants have attempted to educate their organizations about the differences between the two classes of system and the implications of those differences. For example, "*I try to stop it, but yeah, it's still that perspective …*" (P3)[3].

The participants were then prompted by a set of IS attributes that are commonly used in IS research. They are shown in Table 4. The attributes have some definitional overlap but were easily understood by the participants. The attribute description in Table 4 was not provided to the participants, only the attribute titles. After considerable discussion the participants added the last two attributes in the table – level of support and structuredness. In identifying the level of support provided to users as an IS attribute they all agreed with P3 that *"… as you move from operational to BI, to unstructured, predictive type stuff, the level of support drops exponentially.*" P4 related that support went from "… *spoon-fed to self-service expertise*". One of the reasons for this situation is that help-staff rarely understand complex reporting and predictive analytics but are comfortable with operational transaction-oriented systems. The second added attribute, structuredness, was mentioned by all participants in one context or another. They talked about the degree of structure in data, information, development methods, reports, models and analytics, specific decisions, and the overall task environment. For example, P2 mentioned "… *unstructured data realm…*", P6 "… *structured standard reporting …*", P5 talked about "… *structuring data …*", and finally, P6 mentioned "… *unstructured type environment …*". While the use of the concept was quite varied, structuredness was obviously an important construct for the participants.

Attribute	Description
Scope	The system may be for a small set of users, a department or division, the whole organization, or be trans-organization.
System scale	The IS may be on a range of devices, have varying volumes of data, have varying lines of code, or different procurement costs.
Task	They can be routine or ad hoc, simple or complex, highly defined or unspecified or poorly understood.
Decision types	Decisions can be System 1 (unconscious, fast, intuitive) or System 2 (conscious, slow, rule-based) in nature or be a strong interaction of the two cognitive systems (Kahneman 2011).
Users	Users could be operational or administrative staff, professionals, managers, executives, customers, suppliers, or others.
User discretion	System use may be discretionary or compulsory.

[3] The focus group participants are identified in the discussion as Pn.

Attribute	Description
Technology	Systems can use a wide variety of bespoke systems, vendor supplied packages, or platforms.
Development methods	The most common division is between agile and waterfall methods. Some vendors and consultants use and sell propriety methods.
Governance	The IT governance archetypes are business monarchy, IT monarchy, federal, IT duopoly, feudal, and anarchy (Weill and Ross 2004).
Support provided*	Users for different systems will get varying technical support and help with using the system.
Structuredness*	There is a varying degree of structure in data/information, development methods, reports, models/analytics, specific decisions, and the overall task environment.

* Not prompted by the focus group moderator and emerged from the group discussion.

Table 4. Attributes of Business Information Systems

The participants were then asked to think about types of business IS from their perspectives. They were not asked to explicitly consider the attributes in Table 4 in their discussion, but they may have been anchored by them after the discussion. An analysis of the focus group transcript yielded the business IS types in Table 5 and the descriptive content in the cells. The shaded cells indicate aspects of the systems where no data was available to form a conclusion. It is important to note that the content of Table 5 is only taken from the empirical research and not from the definitions and academic research presented in Section 2 of this paper. There was general agreement that business IS could be classed as either operational or supporting decision making. This is in line with the business IS classification of Clark et al. (2007). Later in the discussion the participants divided systems that support decision making into two major categories.

The focus group discussion identified tensions between an organization's IT departments' view of BI and the decision support needs of the organization. This tension is caused by large-scale BI systems typically being developed by the central IT function of an organization. This locus of development is probably a result of the system scale and the corresponding large budgets. Participants agreed that BI systems developed by the IT function tend to use operational IS development methods and governance approaches. The IT function is expert and comfortable with this scenario. The final column in Table 5 shows organizations' response to these central IT practices – shadow IT systems (Behrens 2009). In a sense, shadow IT is a consequence of central IT not acknowledging the differences between BI and operational IS. P4, who was from a major software vendor, related "*What we've found over time is if IT are developing these central BI data warehousing systems that might not be meeting lines of business such as marketing or human resources. We'll go and build their own shadow IT project …*". That is, one of the world's biggest software companies is being used by business functions to develop BI systems in parallel with, or instead of, the organization's central IT function. The development of such shadow systems depends on the budgetary authority of the sponsoring functional executive.

Table 5 illuminates the understanding of the senior professionals in the focus group of the differences between operational IS, BI, and DSS. The categories were not suggested by the researchers. Traditional BI systems, especially those that focus on reporting, have some similarities with operational business IS. These two systems types share settings of six of the 11 attributes. While the attributes have no individual weighting, the similarity of around half of the system attributes is interesting. It does mean, however, that traditional BI systems as identified by the practitioners are still significantly different to operational IS. On the other hand, BI systems that are focused on analytics only share one of the 11 attributes – the conscious, slow, rule-based, and effortful nature of the decisions that are supported. For the unstructured BI type identified by the participants, there are no attribute settings in common with operational IS and only two with traditional BI. This means that the analytic BI systems and unstructured BI systems identified in the focus group are radically different types of business IS compared to operational IS.

Attribute	Type of Business Information Systems					
	OPERATIONAL		SUPPORTING DECISION MAKING			
	Front-end/ Transactional	Internal Business Process	Traditional BI	Analytics	Unstructured BI	Shadow/ Self-service BI
Scope	Business function	Business function	Decision		Decision	Line of business
System scale	Large (batch)	Large	Large	Small to medium	Small	Medium
Task	Repetitive, frequent	Repetitive, frequent	Standard reports, ad hoc reports		Non-repetitive, unknown questions	
Decision types	System 2, Transaction oriented	System 2	System 2	System 2	System 1, 2	System 2
Users	Operational, admin staff, customers	Operational, admin staff	Managers, executives			Different people in functional area
User discretion	No	No	Yes	Maybe	Yes	
Technology	ERP, Ecommerce	ERP, bespoke operational systems	Data warehouses, marts, BI presentation	Statistics software, open source, data science	DSS, AI, Excel	Self-service BI tools
Development methods	Highly structured	Highly structured	Highly structured, SDLC	Agile	Agile	
Governance	Highly governed	Highly governed	Highly governed	Low	Low, Feudal or Anarchy	Low to medium, Feudal
Support level	High	High	Medium	Low	None	
Structuredness	Highly structured data & processes	Highly structured data & processes	Highly structured data & processes, Standard reports	Varying data structure	Lack of structure in data & processes	Highly structured data & processes

Table 5. Classification of Business Information Systems

Table 6 shows a comparison between the academic definitions of business IS, DSS, and BI from Section 2 compared to the views of senior professionals from the focus group. Unlike the influential Clark et al. (2007) binary definition of IS as being divided between systems to support business operations and systems to support decision making, the empirical results from the research shows that practitioners perceive business IS to be divided into three distinct IS types. Using the empirically derived terminology of Table 5, the first type is operational business systems, the second type comprises traditional reporting-based BI and highly structured analytic BI applications, and the third comprises unstructured data and analytic applications. The third type is close to the academic definition of a DSS.

IT Artifact	Academic Definition	Practitioner View
Information system (IS)	An IS is a socio-technical system that uses information technologies to support the operations and management of organizations.	Operational IS that automate internal business processes, process transactions, and provide a front-end for the organization.
Decision support system (DSS)	DSS are small-scale information systems that assist decision makers in difficult, complex, and non-routine decision tasks.	Small BI systems or DSS that support non-repetitive, unknown questions. Also includes some analytic BI applications that use unstructured data or support poorly understood decisions.
Business intelligence (BI) system	BI systems are large-scale systems that combine information technologies, data reporting, and analytic processes in order to support decision making in an organization.	Large scale centrally developed or shadow BI systems that focus on reporting to decision makers. Also includes analytic BI applications that focus on well understood decisions with structured data.

Table 6. Academic and Practitioner Views of Business Information Systems

Figure 1 shows an alternative approach to understanding the nature of business IS that was identified by the focus group participants without any prompting. The representation they discussed is a business-school two-by-two model. One axis defines data as structured or unstructured; “highly structured data” was also mentioned. The other axis involves the degree to which business processes and decisions are understood. This conceptualization yields four quadrants or types of IS projects. The participants concluded that virtually all operational IS and traditional BI systems are in quadrant A. Participants thought that systems in quadrants B and D were extremely difficult to attempt to develop. Quadrant C they believe is the realm of bespoke systems. These can be small-scale DSS, social systems, or interactive applications like chat functions. Figure 1 seemed to be used as a tool for consultants and developers to decide a priori whether a project is likely to be possible or successful – quadrant A is where success is likely.

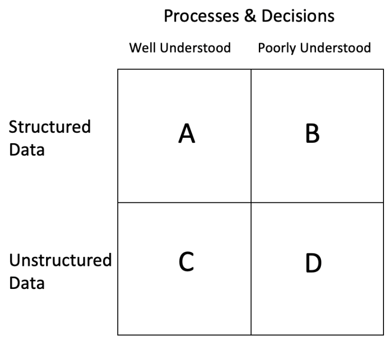

Figure 1: An Alternative Representation of Business Information Systems

Most IS definitions and classifications assume that business IS are discrete systems rather than complex interrelated systems like contemporary cloud and platform approaches (Ceccagnoli et al. 2012). The idea of platforms was only very briefly mentioned in the focus group. P3, who is from a large private company, hinted at a changing relationship between BI and operational IS by relating "*… now we're looking at decisioning platforms and how do we bake predictive insights into our operational processes …*".

The second focus group session in some ways challenged the findings of the first session. When reconsidering the business IS types that were established in the first session, P4 said "*I would say it's a bit confining, as well, because I'd say not every system or business process, you could categorize. I see them more as a number of continuums*". This meant that a different way of conceptualizing Table 5 would be to have the columns defined by one attribute at a time. This would yield many alternative views of the table. The group found that, in some sense, Table 5 was a systems view of business IS. They discussed other possible viewpoints including the user, technology, and development methods. These are, of course, rows in Table 5. Interestingly, the senior professionals saw the system attributes and types as a complex interaction of constructs. In academic research, the use of rigorous research methods leads to these constructs being viewed in isolation, something the participants found alien, even puzzling.

5 CONCLUSION

In summary, at the end of the focus group, the participants while not completely satisfied with Table 5, could not arrive at a superior representation that they agreed with. Some thought that operational IS could have some lower level or detailed sub-classifications. On the other hand, P1 related "*I don't think there's anything wrong with this framework*". Figure 1, while of use in identifying important aspects of a system's development potential, was not held to be as definitive as Table 5. The participants were united in the belief that there are significant differences between traditional BI, DSS, and operational business IS. They were united in the belief that these differences are poorly understood by central IT functions, as well as by business managers and executives in their organizations. Further, they believe that problems with BI failure and ineffective systems could be, in part, rooted in these misunderstandings. The definitional clarity of business IS is therefore not just an academic exercise, it is important for the development and use of all types of business IS in organizations.

The findings from this first exploratory research stage will be used as a foundation for further study. As mentioned above, the focus group approach has limitations especially with the validity of the sampling. However, we believe that the advantages of genuine expert input outweigh the limitations for exploratory research. Accordingly, the next stage of the project will expose the findings of the focus group of IS professionals to a focus group of IS academics. It will then investigate which IS/DSS theories may be useful in BI research and how they should be used.

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