Abstract: How information technology (IT) adds value in contemporary organizations is an important question but clear understanding of this seemingly straightforward question has been quite elusive. In fact, a series of mixed findings led to a general inconclusiveness that became known as the “productivity paradox”. The overarching goal proposed for this study was to draw upon theory and build upon prior investigations in an effort to help further clarify understanding concerning the nature of IT and its value in organizations. To achieve the overarching goal, this study employed the resource-based view of the firm to develop a new conceptual model of firm-wide IT capability.

Key-Words: IT business value, IT capabilities, IT resources, Firm-wide IT capability

1 Introduction
One approach that is helping to increase understanding of IT business value involves the study of an organization’s IT competence or IT capability. As Bharadwaj [5] have noted, “with such increased emphasis on the strategic role of IT in contemporary organizations, it is imperative to gain a deeper understanding of the factors that govern a firm’s IT capability. Yet, there exists very little understanding as to what constitutes a firm’s IT capability and how it could be measured.” Recent studies exploring IT capability [4][5][12][18][27] have adopted the resource-based view of the firm as the primary theoretical framework for their investigations. The resource-based view also provides an important distinction between resources and capabilities[13][26] emphasizing that capabilities reflect the ability of firms to assemble resources in ways that enable superior competitive performance [1].

Thus, a primary purpose of this study is to employ the resource-based view of the firm to develop a conceptual model of firm-wide IT capability. The model employed in this study builds upon and extends current IT business value knowledge by allowing for the empirical assessment.

2 Conceptualizations of IT Capability
In a more detailed conceptualization, Ross [23] divided the IT function into the two categories of IT assets and IT processes. The three IT assets were labeled human assets, technology assets and relationship assets. The three IT processes were identified as planning ability, cost-effective operations and support, and fast delivery. The central idea in the Ross [23] proposal is that by working in combination, the IT assets and IT processes would contribute to business value.

Feeny [9] identified nine core IT capabilities that were organized across four related areas. The four related areas include: (1) business and IT vision (integration between IT and other parts of the firm), (2) design of IT architectures (IT development skills), (3) delivery of IT services (implementation, dealing with vendors and customers), and (4) the core set of capabilities. In addition, each of the nine sets of core capabilities was ranked to indicate how much it relied on business, technical, or interpersonal skills. According to Feeny [9], the nine core IS capabilities—leadership, business systems thinking, relationship building, architecture planning, making technology work, informed buying, contract facilitation, contract monitoring, and vendor development—represent the primary core activities that need to be effectively managed for overall IT capability.

Bharadwaj [5] reported the development and subsequent validation of a multidimensional measure of IT capability with the following six dimensions: IT-business partnerships, external IT linkages, business-IT strategic thinking, IT-business process integration, IT management, and IT infrastructure. The study reported that tests of the psychometric properties for each of the six dimensions revealed all to be reliable and valid based on the study’s sample of senior IT executives. A recent study [27] conducted an extensive review of the extant IT capability literature and identified eight key categories of IT capabilities: manage external relationships, market responsiveness, IT-business partnerships (manage internal relationships), IT planning and change management, IT infrastructure, IT technical
skills, IT development, and cost-effective IT operations. Wade [27] further enhanced the categorization by mapping the eight IT capability categories onto a typology proposed by Day [7] as a useful way of thinking about the market-oriented competencies of a firm. Day [7] argued that the market-oriented competencies held by a firm can be sorted into three types of processes—inside-out, outside-in, and spanning. Wade [27] offered the following explanations for these three types of processes: (1) Inside-out capabilities are deployed from inside the firm in response to market requirements and opportunities and tend to be internally focused. (2) Outside-in capabilities are externally oriented, placing an emphasis on anticipating market requirements, creating durable customer relationships, and understanding competitors. (3) Spanning capabilities, which involve both internal and external analysis, are needed to integrate the firm’s inside-out and outside-in capabilities.

As exemplified in the various studies mentioned here, most of the more recent conceptualizations of firm-wide IT capability recognize the role of complementarity in creating capabilities that enable sustained performance advantages. Therefore, these studies represent IT capabilities as combinations of resources integrated with other IT and/or non-IT resources, assets, capabilities, and/or processes which work in combination to form an overall or firm-wide IT capability [9][21][23][27].

Fig.1: Resource Categories Work Together to Create IT Capability

Three fundamental ideas become apparent in a review of these studies. First is the idea that IT alone is most often insufficient to produce sustained performance advantages for the firm. Since most IT business value researchers now agree with this first idea [15], the second and third ideas become even more important—especially within the context of resource-based theory. The second idea is the realization that, within any organization, there are at least several broad categories of resources available from which the firm can assemble IT capabilities. The third fundamental idea that became apparent in reviewing these studies builds upon and further refines the second. This third idea suggests that the non-IT resources that are available within the several broad categories of resources for a firm must be combined with IT in ways that create IT capabilities. These IT capabilities then work together to form a firm-wide IT capability that can enable improved performance advantages for the firm.

Fig.1 depicts a simple model adapted from the work of Feeny [9] that represents IT capabilities as a synthesis of the three fundamental ideas that emerged from the review of the literature. In the model shown in Fig.1, the three broad resource categories are identified as technology, human, and organizational. The organizational category is represented in the model as also including both the business and intangible labels. Double-headed arrows among the three categories depict the essence of the third idea: that individual IT capabilities are created through the mutually interdependent integration of IT with non-IT resources.

3 A New Firm-Wide IT Capability Construct

A comparison of the various conceptualizations of firm-wide IT capability provided insight into the development of the new construct. A literature review was undertaken with the goal of synthesizing previous work to develop a comprehensive and integrative conceptualization of firm-wide IT capability.

It should be noted that the Bharadwaj study [5] was the only empirical study that reported the development and subsequent validation of a multidimensional measure of firm-wide IT capability based on the study’s sample of senior IT executives. However, as Lu has stated [16], while “the scales developed by Bharadwaj [5] are a good start,” there is still a “need to develop a more comprehensive measure for firm-wide IT capability.” Therefore, this study has included the Bharadwaj research [5] as one of the predominant studies with the goal of building upon the solid foundation that has been established in that work.

There are a number of strong similarities among the sets of IT capabilities. While these similarities among the sets of IT capability dimensions have suggested several potentially key IT capabilities, the comparison also has revealed some gaps or areas that are in need of clarification. One area that stood out as being different from the other studies was in the Bharadwaj
study [5], which labeled one of its six firm-wide IT capability dimensions as “IT management.” All of the other studies do not include a separate dimension for IT management, but rather appear consistent with the conclusions of Mata [17] who found that IT management plays an integral and important role across the entire spectrum of firm-wide IT capability. In a similar vein, the study by Powell [21] found that IT success was “based on a fusion of people, business, and technology resources with the ‘management difference’ producing the critical distinctive advantage.” And, according to Rockart [22] “…IT management must respond to the changing business and technology environment through effective [management] efforts in each of the eight imperatives.” Therefore, the new IT capability construct does not include a separate dimension for IT management. Rather, IT management is incorporated as a key aspect of all nine dimensions of the new firm-wide IT capability construct.

Another key area that stood out in the comparisons was the disparity among the various characterizations of (a) strategic vision/strategic integration, (b) process redesign/process integration, and (c) various representations of IT planning. This disparity was resolved in the new IT capability construct by adjusting one of the existing [27] dimensions (i.e., IT planning and change management), and by adopting the essence of a dimension that was widely used in most of the other studies (i.e., strategic vision, integration, or management). These two dimensions are labeled in the new construct as IT strategic change management and IT and business strategic integration. Eisenhardt [8] concluded that in moderately dynamic markets, resource-based theory “is enhanced by blending its usual path-dependent strategic logic of leverage with a path-breaking strategic logic of change.” These two dimensions help address this blending of leverage and change in the new IT capability construct.

A final area that was noticeable in the comparisons was the disparity among the various characterizations of (a) strategic vision/strategic integration, (b) process redesign/process integration, and (c) various representations of IT planning. This disparity was resolved in the new IT capability construct by adjusting one of the existing [27] dimensions (i.e., IT planning and change management), and by adopting the essence of a dimension that was widely used in most of the other studies (i.e., strategic vision, integration, or management). These two dimensions are labeled in the new construct as IT strategic change management and IT and business strategic integration. Eisenhardt [8] concluded that in moderately dynamic markets, resource-based theory “is enhanced by blending its usual path-dependent strategic logic of leverage with a path-breaking strategic logic of change.” These two dimensions help address this blending of leverage and change in the new IT capability construct.

4 Research study of enterprise companies on Croatian market

4.1 Survey instrument
The key objective of the research has been to empirically assess the conceptual model of firm-wide IT capability in the Croatian large companies? To address the research’s objective, a survey questionnaire was considered the most appropriate methodology. Before a cross sectional field survey questionnaire was pre-tested on professional IT consultants employed by a well known international consulting firm for content validity and readability.
4.2 Research Sample

The questionnaire was then sent to 100 CIOs (Chief Information Officers) in Croatian large companies selected from the Register of ‘100 Large’ companies, which are more likely to represent the structure of the Croatian economy. The survey was performed from September 2009 to April 2010 and was conducted by verbal communication with CIOs.

The survey resulted in 31 responses, representing acceptable response rate, but also limiting the research due to the small scope. The strengths of the methodology used represent the fact that the respondents weren’t self-selecting the questions and themes. They were rather interviewed about their IT Governance and IT business value.

4.3 Analyses of research results

The results of the pre-test, and interviews with CIOs resulted in a final survey instrument totaling 35 items (i.e., questions). These 35 questions were allocated among 10 separate factors. A tenth factor was added based on the results of the pre-test which indicated that the External IT Relationship Management factor should be split into two separate factors (i.e., External IT Relationship Management and IT Outsourcing Management). The interviews with CIOs also confirmed that this split was appropriate. Thus, the 35 items were hypothesized to reflect 10 separate latent constructs. All of the 10 latent constructs were modeled as reflective constructs with each possessing a specific subset of items as indicators (i.e., from among the 35 total items). The 10 first-order latent constructs were hypothesized as acting together to form a second-order construct that provides a more holistic representation of an organization’s overall, or firm-wide IT capability. This second-order construct was modeled as a formative latent construct consisting of its 10 sub-constructs as indicators. Furthermore, based upon the Day (1994) typology, an organization’s overall, or firm-wide IT capability can be thought of in terms of three sub-models. These three sub-models were created by dividing the firm-wide IT capability construct into three separate second-order latent factors (i.e., outside-in, spanning, inside-out), with each also modeled as a formative latent construct, and each consisting of its subset of the 10 sub-constructs as indicators. Table 1 summarizes the association of each latent construct with its sub-constructs as well as the number of indicators associated with each sub-construct.

Assessment of Factorial Validity. The most common Exploratory Factor Analysis (EFA) procedure for assessing the characteristics of a measurement instrument in information systems studies is through a Principal Components Analysis (PCA) [11]. The PCA analysis confirmed that the 35 items did align well with their appropriate theoretical factors in this 10-factor model per the three objectives for EFA as outlined by Gefen [11]. In short, according to the guidelines offered by Hair [14], there were no truly problematic items or cross-loads for each of the 10 factors and their related items identified in the analysis. Thus, the PCA provides evidence of unidimensionality. The item-total correlations for the 10 latent constructs were also examined. The results of the correlation pattern for the analysis indicate that an item posited to reflect a particular construct has a stronger correlation with that particular construct than with any of the other constructs. This result provides further evidence of discriminant and convergent validity in the measurement model.

As another test of discriminant validity, an Average Variance Extracted (AVE) analysis was

<table>
<thead>
<tr>
<th>Latent Construct</th>
<th>Type</th>
<th>Sub-Construct</th>
<th>Type</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside-In IT Capability</td>
<td>Formative</td>
<td>IT External Relationship Management</td>
<td>Reflective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IT Outsourcing Management</td>
<td>Reflective</td>
<td>3</td>
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<td></td>
<td></td>
<td>IT Market Alertness and Responsiveness</td>
<td>Reflective</td>
<td>4</td>
</tr>
<tr>
<td>Spanning IT Capability</td>
<td>Formative</td>
<td>IT Internal Relationship Management</td>
<td>Reflective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IT and Business Strategic Integration</td>
<td>Reflective</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IT Strategic Change Management</td>
<td>Reflective</td>
<td>3</td>
</tr>
<tr>
<td>Inside-Out IT Capability</td>
<td>Formative</td>
<td>IT Infrastructure Management</td>
<td>Reflective</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td>IT Technical Skills and Knowledge</td>
<td>Reflective</td>
<td>4</td>
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<td></td>
<td></td>
<td>IT Development and Acquisition</td>
<td>Reflective</td>
<td>4</td>
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<td></td>
<td></td>
<td>Cost Effective IT Operations</td>
<td>Reflective</td>
<td>4</td>
</tr>
<tr>
<td>Firm-Wide IT Capability</td>
<td>Formative</td>
<td>Includes all 10 of the sub-constructs above</td>
<td>Reflective</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 1. Measurement of Constructs
conducted to determine if the variance shared by a construct with its indicators is greater than the variance shared with other constructs in the model. The results of the AVE further support discriminant validity within the measurement model based upon the criteria that a construct is considered to be distinct from the other constructs in the model if the square root of the AVE for that construct is greater than the construct’s correlations with the other latent constructs in the model. As a final test of unidimensionality in the 10-factor, 35-item measurement model, Amos Graphics 5 was used to test for dimensionality among the 10 factors. This approach involves using a chi-square difference test to evaluate two nested models within Amos. The procedure involves the comparison of an unconstrained model that estimates (or “frees”) the correlation between a pair of constructs and a constrained model which fixes the value of the construct correlation to unity. A significant chi-square difference suggests that the unconstrained model is a better fit for the data. Such a result supports the existence of discriminant validity among the factors [2][12][25]. The results of the nested model comparisons for the 10-factor, 35-item measurement model found that the chi-square difference test was significant (p = .000, alpha = .05). This result implies that all 10 factors are needed in the model and that each factor is indeed different from the others. The result provides further evidence of discriminant validity among the factors.

Assessment of Internal Consistency. To further investigate the pattern of association among the 10 factors and 35 items of the measurement model, the internal consistency of the first-order factors of the measurement model was assessed using Cronbach’s Alpha [6] and Fornell and Larcker’s [10] measure of composite reliability. Internal consistency refers to the degree of consistency between multiple measurements of a variable, while reliability is an assessment of this internal consistency [14]. Since unidimensionality is an assumption underlying the calculation of reliability, it is appropriate that evidence of unidimensionality of the latent constructs was established prior to assessing reliability. Based on guidelines offered by Nunnally [19], a reliability score of 0.70 or above is an acceptable value for internal consistency for exploratory research. Thus, all of the constructs of the measurement model exhibit acceptable levels of reliability, with most possessing scores well above the minimum recommended value of 0.70. Considering the overall results of these tests for factorial validity and reliability, the collective evidence suggests that the 10 latent constructs of the measurement model all possess good measurement properties.

5 Conclusion

Thus The newly developed instrument was used to measure the state of development of IT capabilities within the sampled firms, and this data was used to empirically test the relationships within the new conceptual model. The findings of this research demonstrated that firms leverage IT resources in combination with other complementary IT and/or non-IT resources to create complex, higher-level IT capabilities that work together to form an overall firm-wide IT capability. Because the results of past studies have been mixed, this study’s finding provides strong evidence for a favorable relationship between IT capability and firm performance and extends the IT business value knowledge base. The fact that this study used a higher-level, more comprehensive, firm-wide representation of IT capability may suggest that the IT-firm performance relationship is more completely evaluated from an overall, organization-wide perspective.

While the literature has shown that the formation of IT capabilities takes time, this study suggested that firms may reap positive performance benefits from each of the individual sub-process groups that underlie the firm-wide IT capability construct. This research found evidence that the combined benefits of the overall firm-wide IT capability construct may outperform the benefits of any of the individual sub-process groups alone. Thus, this research suggests that firms may reap the greatest benefit through forming a fully developed firm-wide IT capability construct. Information that can be used by organizations as a starting point for beginning the process of developing the key set of 10 IT capabilities as described in this study can be found within each of the IT capability construct definitions and the respective indicator statements.

In keeping with the idea of a cumulative research tradition it is hoped that this study will provide a useful foundation for future empirical studies to employ resource-based theory as a lens to examine the more comprehensive conceptualization of IT business value through the relationships between firm-wide IT capability, internal and external influences, and the competitive performance of the firm.

References:


