Impacts of Openness on the Success of Information System Development Research Projects

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ABSTRACT

Information Systems Development (ISD) research projects are those in which the conduct of research is not possible without the development of a tangible ICT solution. ISD research projects face inherent tensions between the need for exploration (i.e. radical innovation) and exploitation (i.e. incremental innovation). This requires varying degrees of openness to balance the exploration of new opportunities and exploitation of existing capabilities. In this paper, we investigate the management of openness in ISD research projects and their impact on project success. Findings from three ISD research projects are outlined which offer contrasting approaches to the management of openness. Each management approach is then evaluated according to the perspectives of success in the balance scorecard for projects i.e. Financial, Customer, Internal Business, and Learning and Innovation. Finally, key learnings from the projects are presented, as well as concluding remarks on success in ISD research projects.

Author Keywords

Openness; Ambidexterity; Project Success; Information Systems Development; Research; Management; Interdisciplinary; Industry-Academia Collaboration.

ACM Classification Keywords

H.1.1 **[Information Systems]:** Systems and Information Theory.

INTRODUCTION

In recent years, 'openness' has become an increasingly important topic for information systems research and practice. For instance, openness is an embedded feature of areas such as: open innovation [1, 2], open data [3], and open source software [4, 5], to name but a few. The term

'openness' can be defined as a lack of restriction or boundaries in participation (i.e. egalitarian), transparency and accountability in decision-making (i.e. meritocratic), and receptiveness to change in processes (i.e. self-organizing) [6, 7]. In the context of Information Systems Development (ISD), openness can empower team members to engage in exploration during activities such as system analysis and design, coding, testing, and implementation. In contrast, a more 'closed' approach to ISD would afford team members less autonomy around the conduct of activities, in lieu of a more autocratic-exploitation approach that prioritises the completion of activities within time and budget constraints.

The management of openness is seen as crucial to the innovative performance of organizations, and requires 'ambidextrous' approaches [8-10]. Ambidexterity seeks to successfully manage openness by balancing the dichotomy of 'exploration' and 'exploitation' through different internal structures and processes [8, 11]. Exploration refers to cultivation of radical innovation through the investigation of emerging opportunities in often unfamiliar areas while, exploitation refers to the utilisation of existing capabilities through efficiency and convergence in management. The need for ambidexterity is also present in *ISD research projects*, which seek to integrate the conduct of research (basic and applied) with ISD practice. ISD research projects are those in which the conduct of research is not possible without the development of an ICT solution. Therefore, the two components are inextricably linked. For instance, in the connected health domain, ISD research projects are required to marry the conduct of a clinical investigation (i.e. research) with the delivery of a tangible ICT platform (i.e. ISD practice). Limited attention has been directed towards the management of openness in ISD research projects in extant literature to date.

The relationship between research and ISD practice is inherently complex, which creates challenges around the management of openness in ISD research projects. In our discussion with senior researchers, the tension between 'doing the right things' (exploration) and 'doing the things right' (exploitation) was identified as a critical issue in ISD research projects. In particular, this tension regularly emerges when research funders require 'pre-baked' proposals for ISD research projects, even when those

proposals involve unexplored and novel research topics. Such projects therefore require ambidextrous management approaches that can balance the exploration of unknown opportunities (research), with exploitation of pre-defined capabilities (ISD practice). The key challenge is how to best manage exploration with the equal need to exploit the effective delivery of outcomes on time and within budget.

Traditionally, a successful project is one that is: (i) technically correct and performed in the manner intended (i.e. cost, time, and performance), and (ii) where the project team can interface effectively with the client organisation to maximize value (i.e. use, satisfaction, and effectiveness) [12]. While this definition of project success might be appropriate for projects focused primarily on exploitation, it overlooks the inherent need for ambidexterity in ISD research projects and in particular the need for exploration. Success in ISD research projects equally rests on the ability of the team to generate learnings and innovation through the exploration of new opportunities, as well as the delivery of project outcomes through exploitation.

The motivation for the research is to explore the management of openness in ISD research projects and the impact of different degrees of openness on project success. The paper centres on three ISD research projects which provide divergent and contrasting examples of approaches to the management of openness. The next section provides a high-level overview of these projects.

RESEARCH METHODOLOGY

Three ISD research projects were purposefully selected based on an identified set of shared characteristics, as detailed in Table 1.

Feature	Shared Characteristics
Research	Each project involved the conduction of qualitative and quantitative research, and the publication of findings.
Collaboration	Each project consisted of academic and industry partners, an interdisciplinary team, and involvement from the health sector.
ISD	Each project had to deliver a novel ICT solution which would meet commercialisation, IP transfer, and technology readiness requirements.
Funding	Each project was co-funded by cash and benefit in kind (BIK) contributions from industry and the public sector.

Table 1. Shared Characteristics of Openness Across Projects

However, the projects differed in their degree of openness. In regards to the management approaches, each ISD research project exhibited differences around the characteristics of project governance, project management, and the level of experience of the individuals in the project manager role. The openness of each project also differed in terms of transparency in decision making, the use of open source software, and the level of open collaboration between academic and industry partners.

The lead author as action researcher was a member of the interdisciplinary team of each project. The risk of research bias was addressed by triangulating multiple sources of evidence to increase the robustness of findings [13, 14]. For instance, data collection in each project was conducted using the following techniques: active participation, participant observations in the field, semi-structured interviews with members of the project team, and project documents and emails [c.f. 13]. The following sections provide a brief overview of each project.

Expansion Strategy Innovation Partnership (ESIP) Project

The Expansion Strategy Innovation Partnership project was a collaborative effort between a financial technology (FinTech) research centre operating within a third-level university, and a prominent health insurance company operating in the Irish health insurance market. The project aimed to deliver two outputs: a diversification strategy for the health insurance company to enter into a foreign healthcare market, and a technology solution for enhancing customer engagement in this foreign market. At a more general level, the purpose of the collaboration was to develop new knowledge, products, processes, and services through mutually beneficial co-operation and interaction, and to create strategies to exploit these outcomes going forward. The interdisciplinary project team consisted of an actuary, executive director, project manager, and business development manager (all from the health insurance firm), and two co-PIs, three research assistants, and a User Experience (UX) developer (all from the FinTech research centre).

The Connected Health Platform (CHP) Project

The Connected Health Platform project was a collaborative effort between a research centre, a large global technology company, a local start-up, and a national health insurer. The project was to have two primary outputs: first, a connected health platform to enable the remote monitoring of expectant mothers' wellbeing across different settings. This platform was to integrate a number of ICT solutions including an Electronic Health Record (EHR), smartphone app, a blood pressure monitor, and urine analyser. Second, a research study was to be conducted involving expectant mothers, with the deployed platform used to record symptoms, blood pressure, and urine readings. The interdisciplinary team consisted of a clinical researcher, clinical lead, research nurse, two developers, a project manager, analyst, and Principal Investigator (all from the research centre), and members from the start-up, health insurer, and global IT company.

The Clinical Decision Support System (CDSS) Project
The Clinical Decision Support System project was a collaborative effort between the Neonatal Intensive Care Unit (NICU) ward in an Irish hospital, and a research centre. Industry partners also provided financial support and BIK for the project but were not directly involved in its conduction. The project had two main objectives: the development of a software solution to support clinical decision making in the NICU ward, and the conduction of a research study to evaluate the impact of this solution for improving pre-term infant growth and outcomes in the NICU and Special Care Baby Unit (SCBU) wards. The interdisciplinary team consisted of: a developer, dietician, research support officer, a PI and postdoctoral researcher (all from the research centre), and a NICU dietician, pharmacist, and clinical lead (all from the NIUC ward).

The next section describes the management of openness in each project in more detail. The benefits and drawbacks of the management approach adopted in each project are also discussed.

DESCRIPTION OF PROJECT EXPERIENCES
The section describes approaches to the management of openness across the three ISD research projects: the ESIP project, CHP project, and CDSS project.

Case 1: ESIP Project ('Closed' Archetype)
A 'closed' approach to management was adopted by the industry partner in the ESIP project. This approach consisted of a focus on exploitation, centralised decision making, and autocratic leadership. The actuary, executive director, project manager, and business development manager in the health insurance firm were conferred with 'de-facto' autocratic power to dictate all aspects of the project scope (i.e. problem formulation), how the tasks would be undertaken by the researchers (i.e. method formulation), and the project deliverables that would be sought (i.e. solution formulation). The project manager and business development manager created a detailed project plan and assigned task allocations to each researcher in order to mitigate risk and ensure that output would be maximised during the conduction of project activities. For instance, each of the three research assistants was assigned a potential market territory that was of interest to the industry partner's future expansion strategy i.e. third party administration of self-insured trusts, health cash plans, and private medical insurance. The project manager then sought to micro-manage the conduction of the research work and followed up regularly with the researchers by email to direct the work that should be completed, and assign additional tasks. Although not outlined in the original project proposal, the actuary, executive director, project manager, and business development manager justified this approach to management based on the health insurance company's cash and BIK contribution to the project and the key role they played in winning funding for the project.

Benefits of the Approach
The management approach in the ESIP project aimed to maximise exploitation and mitigate any potential risks. The project manager was satisfied that by tightly managing the conduction of the practice they could maximise the benefits accruing to them from the project and mitigate risks i.e. that the work being carried out by the researchers would not align with the health insurer's interests. This perception aligned with the health insurer's focus on risk mitigation within their own organisation, and provided reassurance that the project was progressing steadily with pre-ordained measurable outputs being demonstrated. Another perceived benefit of this approach to management was that it allowed members of the FinTech research centre and the health insurance company to progress work quickly with minimum delays. There was little space for uncertainty around what work needed to be undertaken and the quality indicators by which the work would be evaluated. One co-PI later referred to the ESIP project as "*the Rolls Royce of research projects*" given the positive working relationship that developed at a senior level between the FinTech research centre and the health insurance company. This relationship enabled the team to resolve areas of uncertainty in the project quickly and resolutely.

Drawbacks of the Approach
The primary drawback of the exploitation and autocratic approach to management adopted in the ESIP project was that it inhibited the researcher group's ability to explore. The researchers felt that their full potential would have been better realised if they had been afforded more freedom in their activities. However, the researchers were afforded limited autonomy to explore alternative formulations of the problem, method, and solution, and engage in 'constructive conflict' [c.f. 15] to question the assumptions of the industry partner. This seems to suggest a lack of trust between the two partners in regards to their individual interests in the project. In addition, the de-facto client-provider relationship sometimes created tension between the researchers and members of the health insurance company, as researchers felt that the industry partner was very demanding in terms of the work that they assigned, while at the same time, they were less willing to contribute to the actual conduction of project activities. The co-PIs had to manage the health insurance company's expectations around what the researchers could realistically achieve given the finite resources that were available and the amount of output that could be delivered during the researchers' working hours.

Case 2: CHP Project ('Hybrid' Archetype)
A 'hybrid' approach to management was adopted in the CHP project to try and balance the exploitation of project deliverables with the need to openly explore alternative formulations of the problem, method, and solution. This approach consisted of a focus on participatory decision making and democratic leadership. The approach utilised project plans, division of labour, and deadline setting;

however, space was still provided to allow the problem formulation, method formulation, and solution to gradually evolve. For instance, the project manager adopted an agile method which emphasised the participatory design of a minimum viable product and iterative prototyping using open source solutions e.g. the EHR. A number of full-day workshops were organised to allow for constructive conflict between partners and to co-create work package descriptions, resource plans, and timelines with a view to delivering outputs on time and within budget. In addition, the project management group also designed tools to explore issues of complexity through constructive conflict between partners. For instance, the analyst and project manager iteratively designed an 'Integrated Patient Journey Map' to highlight complexity around expectant mothers' journeys through pregnancy, in light of constraints such as the clinical pathway, medical protocol, and regulations [16]. Open source software solutions were used to expedite the development process and create prototypes for gathering system requirements.

Benefits of the Approach
The approach to management in the CHP project sought to foster constructive conflict among interdisciplinary team members which in turn cultivated innovation and built shared understanding among partners. For instance, the iterative prototyping of an open source EHR helped surface contention around issues of Intellectual Property (IP) between the industry and academic partners. In particular, it helped open up dialogue around the global IT company's desire to utilise proprietary solutions to develop the EHR that conflicted with the research centre's preference for utilising an open source platform to open up commercialisation opportunities for all industry partners involved. As stated by the project manager: "*there were some teething problems, especially around build or buy, proprietary or open source. Decisions were made which were supposed to be better for the project, but didn't necessarily align with what the partner felt was best for it. But in fairness the (research center) stuck to its guns*". In addition, the approach to management in the CHP project also ensured that project deliverables were continuously managed in light of the significant resource and budgetary constraints faced. For instance, a project plan was co-designed by all team members during a scheduled workshop and then later coordinated by the project manager. This project plan outlined the tasks, division of labour, and deadlines required for the completion of each project deliverable in line with the limited resources that were at the project's disposal. Interdependencies between tasks were also highlighted such as those between the start-up and developers in relation to the delivery of a Bluetooth interface for connecting the smartphone app with the blood pressure monitor and urine analyser.

Drawbacks of the Approach
The participatory and democratic approach adopted in the CHP project sometimes created challenges around balancing autonomy and authority in practice. The project management team often found it difficult to arrive at a balance between empowering team members with freedom to undertake work independently, and closely managing project deliverables through exploitation. This tension in turn created challenges around management. For instance, conflict arose during the project planning workshop when one partner, the start-up, refused to commit resources towards an assigned technical deliverable. During the workshop, the start-up asserted that they could not commit to the project plan, citing resource constraints in their organisation. Other members of the team were sceptical of this and felt that the start-up was trying to renege on prior obligations to the project. As a result, this conflict created challenges for the project manager around how to mandate the completion of work in the face of the start-up's lack of commitment. In the end, a compromise did not seem possible and eventually the project manager and PI took steps towards reducing their reliance on the start-up for the completion of the remaining technical work.

Case 3: CDSS Project ('Organic' Archetype)
An organic approach to management was adopted in the CDSS project to enable the open exploration of the problem formulation, method formulation, and solution formulation. This consisted of exploration, decentralised decision making, and laissez-faire leadership. In contrast to the ESIP project, exploitation was not undertaken and the assignment of an official project manager role was postponed. The PI instead provided team members with de-facto autonomy to decide how best to manage activities in practice, while still coordinating project goals at a high level. The resulting approach to management afforded team members the freedom to engage in ad hoc discussions around potential challenges in the practice, to investigate ways in which these challenges could be addressed, and to explore alternative solutions. For instance, the developer and project dietician worked together closely on an ongoing basis to contextualise technical and clinical risks around the research study by drawing on their individual disciplinary expertise and experience. The risks highlighted during these discussions were then further explored during project team meetings between the rest of the research team and the clinicians. For instance, one such risk identified by the developer and project dietician concerned the timing of a new policy implementation in the NICU which they felt could constitute as an additional intervention in the study.

Benefits of the Approach
The approach to management in the CDSS project empowered each team member with the freedom to continuously evolve the formulation of the problem, method, and solution. For instance, members of the team were afforded the flexibility to conduct assigned actions from meetings as they saw fit, based on their disciplinary expertise and learnings. In particular, the developer was afforded wide ranging autonomy by the PI to undertake work around the development of the software solution and

dedicate time to relevant tasks which he saw as important. This approach also provided the space for team members to engage in open dialogue and address inherent complexity around the delivery of the clinical decision support system, and the conduction of the research study. For instance, open dialogue between the team members helped highlight previously unknown challenges in the research study such as the potential for unintended cultural and behavioural change in the NICU practice arising from the implementation of the CDSS, which in turn might compromise the effectiveness of the control group in the research study. Some team members felt the freedom afforded to the team through this management approach was important to manage complexity inherent in the practice, given the novel and exploratory nature of the research area.

Drawbacks of the Approach
The exploratory and autonomous approach to management in the CDSS project contributed to additional features of uncertainty due to the difficulties faced in monitoring and controlling project deliverables. For instance, as a consequence of the autonomy conferred around the management of activities, the PI had to place high levels of trust in the ability of team members to self-manage project deliverables, often within disciplinary silos. In particular, the PI placed unwavering faith in the developer's ability to manage technology deliverables independently, in part as she felt less able to assess the quality of his work due to disciplinary boundaries with her own area of expertise: "*It's difficult at times to see the progress cause I don't understand what's going on in the backend... There has to be massive trust, that's really problematic for me*". The absence of a project manager role and project plan also meant that hard deadlines were not agreed or discussed when tasks (such as requirements gathering and software development) would begin and end; therefore, questions were seldom raised around whether project work was running according to schedule. The developer doubted the likelihood that the provisional deadlines for having the system complete would realistically be achieved. The developer felt he was working hard to keep the project on track despite the delays in receiving clinician feedback.

The next section describes lessons learned from the cases.

LESSONS LEARNED
The following subsections describe three different approaches to the management of openness, as based on an analysis of findings from the three projects. In addition, the 'law of the lever' is used as an analogy to understand the act of balancing exploration and exploitation in each project, where the degree of openness is represented as a 'lever', the ISD research project is represented as the 'fulcrum', and the management approach is represented as the 'load'. Depending on the management approach, the degree of openness in the ISD research practice will gravitate either towards the side of 'exploration' or 'exploitation'.

'Closed' Archetype
The ESIP project first offers an example of where a 'closed' approach to management was adopted in order to facilitate *exploitation*. The closed approach is relatively straightforward to manage as the focus is solely on the controlled planning of activities through structured task descriptions and allocation, centralised decision making, and autocratic leadership. Figure 1 illustrates the closed approach to management using the law of the lever analogy. The lever is stable as the focus of the management approach is solely on the side of exploitation.
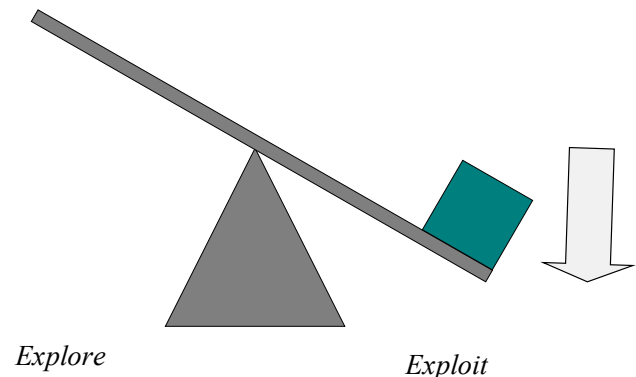

Explore   *Exploit*

Figure 1. 'Closed' Approach to Management
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'Organic' Archetype
The CDSS project then provides a contrasting example in which an 'organic' approach to management were applied to facilitate *exploration*. Similar to the closed approach, the organic approach is relatively stable in that the focus is oriented solely towards one side, that of exploration. This is achieved through de-facto autonomy in task descriptions and allocation, decentralised decision making, and laissez-faire leadership. While the task description and allocation may be unstructured in a formal sense, team members are still required to deliver outcomes within a set timeframe. Figure 2 illustrates the organic approach where the lever is stable as the focus of the management approach is solely on the side of exploration.
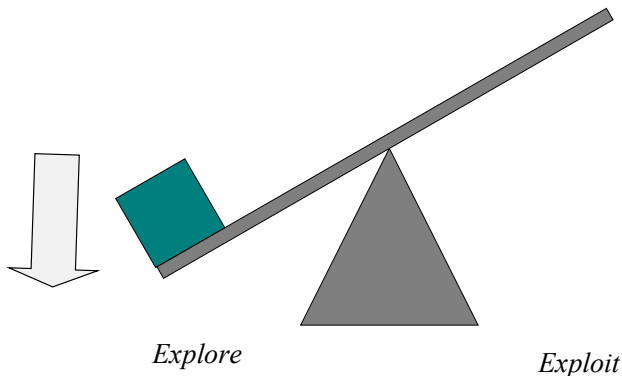
Figure 2. 'Organic' Approach to Management
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'Hybrid' Archetype
Finally, the CHP project illustrates an example of where a hybrid approach to management was adopted to balance *exploration* and *exploitation*. The hybrid approach is more dynamic than the closed and organic approaches, as it requires constant readjustment to ensure ambidexterity in the balancing between exploitation and exploration. This can be a challenging task as there is a constant pull towards either extremes. For instance, ambidexterity, must be undertaken in tandem with participatory decision making and constructive conflict, as well as democratic leadership. Figure 3 illustrates the hybrid approach to management where the lever is wavering between the extremes of exploration and exploitation.
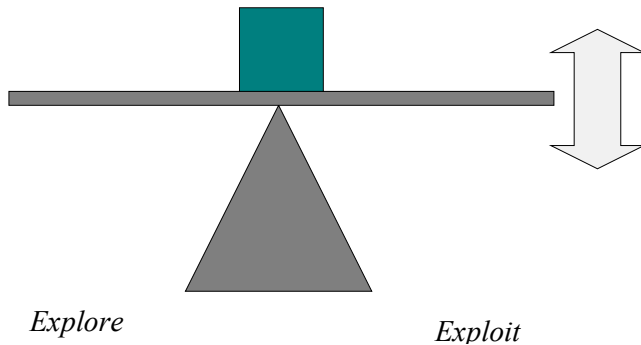

Figure 3. 'Hybrid' Approach to Management
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Three different approaches to the management of ISD research projects are summarised in Table 2. For instance, the closed archetype focuses on exploitation, centralised decision-making, and autocratic leadership. The hybrid management approach centres on ambidexterity, participatory decision making, and democratic leadership. Finally, the organic approach emphases on exploration, decentralised decision-making, and laissez-faire leadership.

Archetype	Degree of Openness	Decision-making	Leadership Style
'Closed'	Exploitation	Centralised	Autocratic
'Hybrid'	Ambidexterity	Participatory	Democratic
'Organic'	Exploration	Decentralised	Laissez-faire

Table 2. Characteristics of Management Approaches in ISD Research Projects

We then built on this categorisation to evaluate the success rate of each archetype based on the four perspectives of the balance scorecard for projects [17, 18]: Financial, Customer, Internal Business, and Learning and Innovation. The Financial perspective first looks at factors such as whether the project came in on schedule, on budget, and whether the project was carried out effectively. The Customer perspective looks at factors such as whether the project outputs have been valuable to clients, whether the client was satisfied with the process by which the project was completed, and whether the project will directly benefit intended users. The Internal Business perspective looks at the impact of the project on the internal processes such as whether the efficiency and effectiveness of internal activities have been improved. Finally, the Learning and Innovation perspective focuses on the impact of exploration in regards to the development of new knowledge and transferable skills among individuals, and the commercialisation of new opportunities.

Table 3 presents the evaluation which was grounded in an analysis of findings from each project by the lead author. The success rate of each management approach is evaluated using an ordinal scale between 'Very High and 'Very Low'. This evaluation across the four perspectives of the balance scorecard was based on empirical data collected in each project. The implications of these findings are discussed further in the following paragraphs.

Archetype	Financial	Customer	Internal Business	Learning and Innovation
Closed	Very High	Low	Low	Very Low
Hybrid	High	Very High	High	High
Organic	Low	High	High	Very High

Table 3. Evaluation of Management Approaches in ISD Research Projects

The closed approach rated very high for the Financial perspective. The ESIP project was completed ahead of schedule, under budget, and to a high performance level. This was due to the focus on exploitation, centralised decision making, and autocratic leadership. However, the closed approach rated poorly on the factors of 'Customer', 'Internal Business', and 'Learning and Growth'. The approach was rated low for the Customer perspective as the health insurer (i.e. client) seemed increasingly unsatisfied with the level of value they had exploited, as indicated

when they commanded the researchers to undertake research in the domestic market late in the project, an area which was outside the scope of the initial proposal. The constraints on exploration meant that the researchers were limited in their ability to innovate, and towards the end of the project a saturation point was reached where the team felt they were unable to identify further opportunities. A low rating was also received for the Internal Business perspective as the health insurer derived limited use from the project deliverables completed i.e. following the conclusion of the project, the ICT solutions and diversification strategy were archived by the health insurer rather than being operationalised in the foreign or domestic market. Finally, the closed approach was rated very low for the Learning and Innovation perspective as the level of transferable skills generated from the project was limited given the market specific nature of the knowledge generated.

The hybrid approach also rated high in terms of the Financial perspective. In the CHP project, the team were able to complete the required project deliverables on time and within budget. This was achieved despite the significant resources constraints faced on the project, which required the research centre to recruit additional part-time staff to meet the shortfall in resources. The hybrid approach received a very high rating for the Customer perspective as the team in the CHP project were able to deliver an innovative platform which met the ambitious targets set out in the project proposal, and satisfy the demands of the clinicians and industry partners (i.e. the clients). A high rating was received for the Internal Business perspective too as the completed platform was successfully deployed in a live healthcare setting in line with the start date of the research study, and follow-up survey results show that this ICT solution has directly benefitted end users. The hybrid approach was rated high for the Learnings and Innovation perspective as well. The learnings generated during the CHP project were significant, and all team members indicated that the knowledge and skills they acquired have benefitted them when working on further projects in the connected health domain. For instance, since leaving the CHP project, the developers have been able to directly apply learnings from the CHP project on other ISD research projects in the health information systems domain.

Finally, the organic approach received a low rating for the Financial perspective. In the CDSS project, the PI had to apply for an extension to the project duration after delays were encountered in the initial timeframe set out for the delivery and certification of the ICT solution. This extension would also require extensions to the budget to ensure that the team could remain employed on the project for the extended timeline. The organic approach however rated high in terms of the Customer perspective. For instance, clinicians in the NICU ward (i.e. client) such as the NICU dietician and consultants, have confirmed their support and commitment to the implementation of the ICT

solution in the hospital. A high rating was received for the Internal Business perspective too as once implemented, the project deliverables are expected to have a strong impact on effectiveness of NICU staff to deliver better nutrition management to pre-term babies. Finally, a very high rating was received for the Learning and Innovation perspective. The exploratory nature of the project has allowed the team members to acquire vast amounts of knowledge in a very complex domain. In particular, the developer has benefited greatly from the organic approach, as stated by the PI on the project: "*(initially we) had a software developer who knew nothing about nutrition; now we have a software developer who can tell you the neonatal nutrition course. Which is kind of amazing.*"

The evaluation suggests that while openness contributes to improved project success in relation to the Customer, Internal Business, and Learning and Innovation perspectives, too much openness can have a negative impact on the success in terms of the Financial perspective. This indicates that while openness is essential to success, excessive openness can impact on a team's ability to deliver outputs on time and within budget. This might be explained by extant literature. For example, Figure 4 illustrates the impact of openness on project success by assuming each archetype is positioned along an 'inverted U-shaped curve', similar to the one presented in Laursen and Salter [10]. The diagram suggests that while openness contributes to higher levels of project success, a tipping point also exists, beyond which openness actually begins to contribute to diminishing returns. This again points to the need to balance exploration with exploitation in ISD research projects.
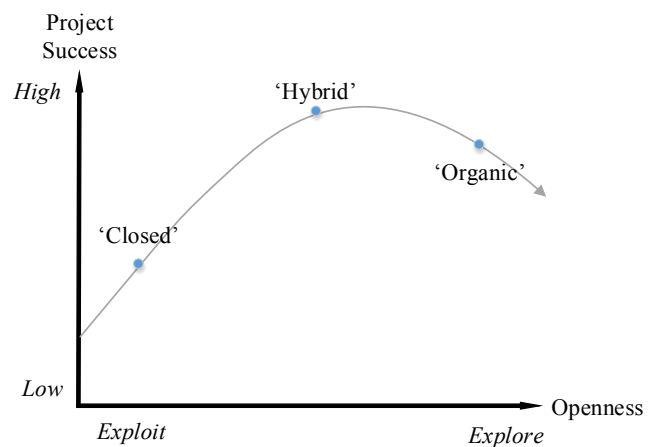

Figure 4. The Impact of Openness on Project Success
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The next section brings the paper to a close with some concluding remarks.

CONCLUDING REMARKS
This paper offers insights into the management of openness in ISD research projects, and the impact on project success. In addition, these insights contribute towards a deeper understanding of openness in extant literature as well as the

nascent area of ISD research projects. As ISD research projects are unique and indeterminable, there may be no single ideal management approach that will be applicable to all contexts. For instance, an approach to management which may have been successfully adopted in one ISD research project could be inappropriate for another given its diverse features. Consequently, a 'panacea' approach to management in ISD research projects does not exist, and instead success rests on the ability of leaders to understand the unique features of both the ISD practice and research activities. For instance, a more closed approach to management may be appropriate where the goal is to minimise complexity, uncertainty, and contention in ISD delivery, at the expense of innovation in research; meanwhile, an organic approach may be more appropriate where innovation in research is prioritised, and there is a higher level of tolerance of complexity, uncertainty, and contention in ISD delivery. We still contend that it is possible to draw out recommendations for ISD research project success; however, such recommendations are beyond the scope of this paper. Future research will seek to address this limitation by exploring recommendations in more detail, drawing on empirical findings and extant literature in information systems and related fields.

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