Data-Driven Gamification Design: An Enterprise Systems Perspective from the Front Line

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Abstract

The need for data-driven gamification in enterprise systems is essential for the design, development and implementation of robust management information systems capability. However, the gamification of enterprise systems need to look beyond the user interface as a key driver of the effectiveness of system design and implementation by taking a more holistic approach. A survey was undertaken of 25 global organisations that have implemented a gamification project which found that enterprises are reporting positive results from gamification projects, but are also claiming that there's still room for improvement across many operational areas. In particular, there are effectiveness issues associated with technology and vendor maturity, and a need to improve the capabilities of organisations in the design and implementation of gamification projects. Design was considered to be a collaborative activity amongst stakeholders, and the process and inclusiveness of the design process was considered to be just as important as the specific design elements employed.

1 Introduction

Data-driven gamification design (DDGD) has been defined as the automation of the gamification design process using data mining and algorithms to personalise the user experience [30]. This domain has arisen out of the need to overcome the perceived problem in gamification design in assigning game appropriate design elements to motivate users and to maximise their expected contribution to the overall system goal [31].

The need for data-driven gamification in enterprise systems can be considered important for the design, development and implementation of robust management information systems (IS) capability.

Decision support systems (DSS) and in particular business intelligence systems (BI) are critical for enterprise management decision making [1] [2] [3] and have been subject to extensive research on user acceptance and utilisation of this technology [4] [5] [6]. Information systems have also recently been subject to how they can be gamified to improve motivational affordances [7] [8] [9]. Research has also focussed on a wide range of fields that include the use gamification mechanics and dynamics [10], experimentation of using then taking away gamification elements as a test for its stickiness [11], an exploration of gamification effects on user constructs [12], and the development of a modelling language for information systems use [13].

BI software is a collection of decision support technologies for the enterprise aimed at enabling knowledge workers such as executives, managers, and analysts to make better and faster decisions [6] [14] [27]. Cognitive and behavioural sciences have traditionally produced empirical information that has assisted in the design of decision support systems from a human-computer interaction perspective [15] [17] and more recently, gamification has been used to develop more engaging user interfaces to encourage asset utilisation [16] [18] and user enjoyment [15] [10].

The contention of this paper is that gamification of enterprise systems needs to look beyond the user interface or motivational affordances as a key driver of the effectiveness of system design and implementation. A gamified enterprise system has essentially two interdependent components; a front-end and a back-end [19]. The front-end relates to the motivational affordances and user interaction elements, which has been the focus area of gamification researchers and practitioners. However, the back-end, relating to DSS and BI systems design and implementation, has not received as much attention. As an emerging domain, DDGD is focussed on the motivational affordances to match or personalise game design elements to user, however, research in management information systems informs us that the engaging design of user interfaces is

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only one of many determinants of the success of an information system [20] [6] [4]. Therefore, the need for a more holistic approach to DDGD is important for its ongoing growth and maturity.

2 Research Focus

To delve deeper into understanding how gamification can be designed and implemented as a holistic system, a research project was undertaken to investigate the direct experience of organisations that have experimented with gamification in their business processes in order to identify the key enablers, barriers, and capabilities for successful implementations. This research was one of three inter-related research studies undertaken as a part of a doctoral research program that also developed and published a gamification design process [32] and gamification taxonomy [28].

This research found that what was missing from the current discourse in gamification research was a lack of first-hand perspectives from enterprise project leaders on the procurement, development and integration of gamification with enterprise systems and processes, and on navigating the internal systemic, cultural and decision-making processes required for effective implementation.

To address this gap, the focus of the research project involved a confidential, in-depth online survey of 25 global organisations that have implemented an enterprise gamification project. This was a selective sample based on organisations that have implemented a gamification project. A total of 40 organisations were contacted and 25 had agreed to participate in the survey. In all cases, the project leader who was responsible for the gamification project had completed the survey. The combined projects in this sample equated to 11.4 million users (a combination of both internal staff and external customers or stakeholders) that have been affected by these gamified enterprise applications.

Most previous research in the enterprise gamification domain has focused on an evaluation of peer-reviewed studies or experiments undertaken in single organisations. Thus, an opportunity was identified in this study to survey a cross-section of global organisations based on their direct experiences with enterprise gamification across a range of strategic and operational factors, to ascertain their common views on enablers and barriers to successful enterprise gamification implementation. The organisations were large global companies with operations in the US, Europe, India and Australia, and the projects were a mix of internal facing (staff) and external facing (customers) gamification projects.

A total of 17 multiple choice questions were asked on a range of operational areas, and three sets of questions using 5-point Likert scales for responses to 20 sub-questions relating to organisational experiences with designing and implementing a gamification project over a range of strategic and operational areas. In addition to these structured questions, three open-ended questions were asked on the topics of key success factors, barriers to success, and recommendations on a design process. Due to space limitations, and relevance to this call, only the results of the three open-ended questions are presented in this paper.

The procedure for analysing the data from the open-ended questions commenced with the documentation of themes using a code-book method which was then used for the systematic evaluation of the text-based responses. Card sorting and affinity mapping methods were used to provide a broad visual display of all the key words/phrases and this then enabled the grouping of responses into themes and categories. This then enabled the quantitative analysis of the qualitative data.

The key theme that had emerged out of the open-ended questions was that the factors raised by respondents tended to cluster around the three categories of management, technology and design issues related to the gamification project. Further investigation showed that this three-part classification of technology, design and management is not uncommon and is a widely used schema in information systems research [33].

Each of these three categories are explored in detail within each of the open-ended questions in the following section of this paper.

3 Results and Discussion

3.1 Question 1: Key Success Factors

Respondents were asked: "*Please name up to three strategies that were key to the relative success of your project",* and a total of 42 responses were received. Management factors received 43% of overall responses, design received 36% and technology 21%. In relation to **management**, the key success factors that were raised included:

- Project management. This included stakeholder engagement and management, communication, sponsorship, and building internal networks.

- Teamwork. This included interdepartmental co-operation, teamwork with vendors and consultants and participation of stakeholders.
- Measurement. This included the setting of clear goals, targets and key performance indicators (KPIs), as well as measuring and reporting on performance against KPIs.

In relation to **design**, the key success factors that were raised included:

- Design aspects. This included setting design objectives and design principles, possessing design skills and an understanding of motivational psychology, prototyping and testing, and aligning game elements to business goals.
- Target audience. This included understanding of the target audience, organisational culture, and undertaking a deep analysis of the players.

In relation to **technology**, the key success factors that were raised included:

- Agile development. This included flexible and iterative development, usability testing, internal support and freedom to select and develop the right technology, and learning from mistakes.
- Technology. This included two key themes – the experience of the vendor, and the flexibility of the gamification platform to meet project requirements.

Respondent sentiment on what was critical to the success of their gamification project is illustrated in the sample responses listed below:

- "Interdepartmental cooperation was essential – IT, HR, Marketing, Financial Planning."
- "We started with a test and learn phase (beta) developed by a small, tight, focused team over a long gestation period (24 months)."
- "It was designed and built brick by brick, and we never lost focus of what we wanted to achieve."

It appears as if most enterprises treat a gamification project as they would any other project management exercise, with results indicating the key to successful implementation centres around project integration and business transformation. This brings into question the need to distinguish what parts of an enterprise gamification project are unique to gamification, and which parts are standard project management issues if they are to be managed effectively.

A deeper investigation of these responses suggests that there may be two key considerations for developing and implementing an enterprise gamification project: (a) the unique challenges of gamification in terms of generating an appropriate gameful design and selecting appropriate gamification technologies, which are often new capabilities for an organisation; and (b) the adeptness in which a project manager can navigate the gamification project through a business transformation process.

The implications for DDGD is that the findings support the notions of a need for more improved gamification design elements and methods, however it warns of the need for more considered attention to the technology that is employed, and the need for building implementation capability and the development of appropriate metrics to make the project an overall success.

3.2 Question 2: Barriers to Success

Respondents were asked: *Please name three barriers to success that you experienced during the project*; and a total of 50 responses received. As a barrier to project success technology received 38 per cent of all mentions, followed by management at 34 per cent, and design at 28%.

Technology factors listed by respondents as a barrier to project success indicate critical shortcomings in core technical IT and IS elements, including: vendor capability, technological limitations, gamification platform restrictions, data integrity issues, limited reporting capabilities, vendors not knowing the target market, on-time delivery, scalability issues, development team resources and user adoption of the platform.

These technology barriers also suggest a significant limitation in the enterprise gamification domain that has not been previously identified in the industry, where gamification failure has generally been attributed to poor design decisions [29]. The existence of this level of technological limitation presents a potentially high barrier to the further growth and development of the domain.

To gain a deeper perspective of respondents' views on gamification technology barriers, below is a selection of their corresponding quotes:

- "Barriers were primarily with technology: we waited a long time for vendors to mature, [and] even then I do not believe vendor solutions are mature enough yet to handle large-scale, complex enterprise use cases. We faced a lot of challenges with integration, especially with our data security requirements."

- "Our IT infrastructure is not state-of-the-art. That meant that the vendor had to develop for an 'old' situation. They could not re-use their new technologies, neither their experience."
- "Gamification platform restrictions are not yet adapted to communities with serious content where reputation and quality are key. There are limited reporting capabilities and data integrity issues."

The key issues raised in relation to **project management** as a barrier to successful gamification implementation are as follows: decision-making, stakeholder management, management buy-in, inadequate envisioning, budget constraints, lack of a clear strategy, resourcing, time pressures, unrealistic expectations and assumptions, and limited organisational priority and communication.

It can be said however, that these factors are not uncommon in the domain of business transformation or change management [21] [22] as well as innovation management [23] [24] [25], yet appear to have received limited attention in enterprise gamification research. To gain a deeper perspective of respondents' views, here is a selection of relevant quotes:

- "In a big organisation such as ours, getting approval for these kinds of projects is tough."
- "The path of decision-making in content development and implementation was and still is quite bureaucratic."
- "Decision-makers could not envision what users will experience when playing the game. That caused the inability to decide."
- "It was hard to measure success and set up KPIs."
- "We didn't have a clear strategy when we started – we had to make it up as we went."

Once again, these issues are common to the project management and change management domain, and these survey results indicate that better use of these corresponding domains could help inform the ongoing development of data-driven gamification for enterprise applications.

Design factors was deemed to be both a major success factor for gamification projects, as well as a notable barrier if it was not done well. Some of the key issues that caused design to be perceived as a barrier include: staff not being familiar with gamification, user resistance to gamification, use of arbitrary game mechanics, lack of game design expertise, too much focus on game elements, and balancing the right game content.

Respondents' concerns focussed on the challenge of balancing the right selection of gamefulness and content to the process or system under review, whilst being constrained by limited stakeholder skills, familiarity and acceptance of gamification. This suggests a difficulty among project teams in understanding design principles and design capability, including how gameful design elements can be creatively integrated into 'serious' business applications.

To gain a deeper perspective of respondents' views on design, below is a selection of corresponding quotes:

- "There were times I felt that I was playing the wrong game."
- "Not everyone liked our design."
- "There was meaningless use of arbitrary game mechanics."
- "There was an inability to identify useful business topics on which to apply gamification."

Specific issues relating to gamification design often appear to stem from frustrations in understanding how design can provide the 'bridge' between the business problem, and the technology front- and back-ends of the proposed solution. The survey results show that enterprise interest in applying gameful design to business problems is often paralleled with a lack of finesse and balance in the design component of the process. This suggests that the role of the designer is essential; yet design and design process expertise appears to be underdeveloped, which has often resulted in less effective design decisions.

The most significant finding in regard to barriers to success (and enablers) was not the responses that were voiced, but rather those that were not. When addressing open-ended questions about barriers and enablers, respondents did not refer to the motivational affordances of the gamification elements or the effectiveness of the project to engage users. Respondents mostly believed that indicators of success, or barriers, are predominantly based on how well a project is managed, the robustness of the technology, and its integration within the organisation's systems and processes. It would appear that motivational affordances in terms of the right balance of gameful design features, while of significant importance, rank secondary to enterprise system and process integration.

3.3 Question 3: Creating an Optimal Design Process

Respondents were asked: *Knowing what you do now, how would you create a better gamification design process?* and a total of 27 responses were received.

Respondents mostly echoed what was said in relation to success enablers and barriers, in terms of the importance of rigorous project management and robust technological platforms.

More revealing however was the high concentration of design factor responses, which mostly related to the importance respondents placed on internal design capability issues. This implies that project management and technology tend to be standard core competencies in the enterprise, while design is less so. This also indicates that design methodologies and capabilities are not yet at the level they should be for enterprise gamification.

Furthermore, these results show that the language used by respondents in the open-ended questions conveyed an operational and tactical focus in their recommendations, rather than strategic or systemic. This indicates that project managers had perhaps confined their gamification projects within an operational paradigm that was within the scope of their capabilities or job description. Alternatively, the projects have so far been smaller and tactical in nature due to gamification only recently being introduced. Very often such projects were reported to be trials, experiments or prototypes, rather than a full-scale re-think or re-design of an enterprise system or process.

Most respondents indicated that they would like to develop a more rigorous design process (59%), followed by more considered project management practices (21%), as well as selection of the right technology for the job (20%). The key factors raised by respondents in relation to improving the gamification design process revolved around the use of more thoughtful use of design practices and the use of gameful elements. The elements included: improved ideation and prototyping, facilitating learning opportunities, using more meaningful design features, developing innovative mechanics (narrative, experience, reputation), using less traditional mechanics (rewards, points, leaderboards), reduction in technological limitations, and careful selection of more capable vendors.

To gain a deeper perspective of respondents' views on the optimal design process, below is a selection of relevant quotes:

- "I would have spent more time at the beginning looking at more into game-thinking elements and fewer game mechanics. I think we would have created a more engaging program."
- "We would like to see an extended version of the game to turn passion and intuitive gameplay into a deeper consideration of the issues."
- "I think that it is more important to be clear on your goals and your audience. There was a disconnect between the prototypes and concepts being discussed and the stated goal, the audience of the game."
- "Be focused on the target audience, define critical success factors for the game at the game design stage, be innovative with the game mechanics."

A close examination of such responses indicates that project owners are in effect talking about the need for sophisticated forms of experience design, game-thinking, and creativity in their gamification designs. However, it would seem that these factors are currently beyond the capabilities of the available technology and the common designs that dominate the enterprise gamification domain. This is supported by the recent findings of the development of a gamification taxonomy [28] that to date, gamification has not produced new or novel design patterns.

The implications for DDGD is that motivational affordances are one element of many in determining the success of a gamified system, particularly if that system is an enterprise DSS or BI. However, caution needs to be made here as design was considered to be a collaborative activity and it is the process and inclusiveness of the design process that is just as important as the specific design elements employed. Therefore, for DDGD to be successful, given its focus on data and algorithms, attention needs to be made on how this can be integrated in a human-centred, collaborative design process.

4 Conclusions

A better understanding of the experiences of organisations gives researchers and practitioners deeper insight in how to design, develop and implement data-driven gamified enterprise systems. This is particularly pertinent as design knowledge is partly informed by practice [26] [27]. Enterprises are reporting positive results from gamification projects, but are also claiming that there's still room for improvement across many operational areas. In particular, there are effectiveness issues associated with technology and vendor maturity, and a need to improve the capabilities of organisations in the design and implementation of gamification projects. The implications for DDGD is

that predictive models of personalising the user experience with game design elements are only one aspect of what would be considered a successful implementation of a (gamified) enterprise system. For the ongoing development of the DDGD domain, attention needs to also be given to developing a holistic approach to system development and implementation.

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